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BULLETIN 294 FEBRUARY, 1928

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Connecticut Agricultural Experiment Station
New Haven, Connecticut

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TWENTY-SEVENTH REPORT

OF THE

STATE ENTOMOLOGIST

OF

CONNECTICUT

1927

W. E. BRITTON, Ph.D.
State Entomologist

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The Bulletins of this Station are mailed free to citizens of Connecticut who apply for them, and to other applicants as far as the editions permit.

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AUTHORSHIP

For bibliographical purposes all material published in this Report (Bulletin 294), unless otherwise indicated, should be credited to W E. Britton.

ILLUSTRATIONS

The illustrations in this Report (Bulletin 294) are from the following sources: Figs. 38, 39, and 48, outline maps shaded by B. H. Walden; Figs. 40 to 47 are maps, charts, and one (Fig. 43) illustrating insects drawn by Dr. Philip Garman. Plates are all from photographs: XXI, XXII a, XXIII, and XXIV, by W. E. Britton; XXII b, by N. E. Guertin; XXV by M. P. Zappe; XXVII c, by P. Garman; XXXIII to XXXVI by R. C. Botsford; all others by B. H. Walden.

BULLETIN 294

TWENTY-SEVENTH REPORT
OF THE
State Entomologist of Connecticut

To the Director and Board of Control of the Connecticut Agricultural Experiment Station:

I have the honor to transmit herewith my twenty-seventh annual report as State Entomologist of Connecticut. This report contains an account of each of the activities of the Department of Entomology of the Station, including the inspection and control operations prescribed by Statute, and the various lines of research in which the members of the Department staff have been engaged during the year of 1927.

Respectfully submitted,

W. E. BRITTON,

State and Station Entomologist.

SUMMARY OF INSPECTION AND OFFICE WORK

305 samples of insects received for identification.
208 nurseries inspected.
206 regular certificates granted.
206 duplicate certificates furnished to be filed in other states.
2 special raspberry certificates granted.
80 nursery dealers' permits issued.
213 shippers' permits issued to nurserymen in other states.
190 parcels of nursery stock inspected and certified.
230 bales of mountain laurel and other decorative material inspected and certified for shipment.
20,000 narcissus bulbs inspected and certified.
259 shipments of seed corn inspected and certified.
34 orchards and gardens examined.
31 shipments, containing 321 cases, 3,229,915 plants, imported nursery stock inspected.
22 shipments, or 70 per cent, found infested with insects or plant diseases.
803 apiaries, containing 8,133 colonies, inspected.
9 apiaries and 23 colonies found infested with European foul brood.
25 apiaries and 57 colonies found infested with American foul brood.
3,336 letters written on official work.
789 circular letters sent out.
385 post cards.
51 reports to Federal Horticultural Board.
2,146 bulletins, etc., mailed on request or to answer inquiries.
86 packages sent by mail or express.
62 lectures and addresses at meetings.

PUBLICATIONS OF THE ENTOMOLOGICAL DEPARTMENT, 1927

By W. E. Britton:

Twenty-sixth Report of the State Entomologist of Connecticut (Bulletin 285), 124 pages, 11 figures, 16 plates; 9,600 copies distributed in April, 1927.

The Asiatic Beetle Quarantine, Bulletin of Immediate Information No. 55, 4 pages, 2 figures, November 10, 1926; 2,000 copies.

The Japanese Beetle Quarantine, Bulletin of Immediate Information No. 56, 4 pages, 1 figure, November 10, 1926; 2,000 copies.

Regulations Concerning the Transportation of Nursery Stock in the United States and Canada, Bulletin of Immediate Information No. 57, 32 pages, November 20, 1926; 1,775 copies.

The Japanese Beetle Quarantine, Bulletin of Immediate Information No. 58, 8 pages, May 16, 1927; 2,500 copies.

The European Corn Borer Quarantine, Bulletin of Immediate Information No. 59, 5 pages, 1 figure, June 1, 1927; 1,500 copies.

Twelfth Biennial Report of the Commissioners of the State Geological and Natural History Survey, Bulletin No. 38, 23 pages, 1 plate, April, 1927.

Mosquito Expugnatus Est, Homo Victor. Engineering News-Record, Vol. 97, page 922, Dec. 3, 1926.

Book Review: Blatchley's Heteroptera of Eastern North America. Entomological News, Vol. xxxviii, page 90, March, 1927.

Organization of a Co-operative Campaign Against the Asiatic Beetle. Journal Economic Entomology, Vol. 20, page 359, April, 1927.

The Japanese Beetle in Connecticut. Proceedings 36th Annual Meeting Connecticut Pomological Society, page 45, April, 1927.

Report of Committee on Injurious Insects. Proceedings 36th Annual Meeting Connecticut Pomological Society, page 40, April, 1927.

By W. E. Britton and M. P. Zappe:

Inspection of Nurseries in 1926, 13 pages (reprinted from the Report), 300 copies, April, 1927.

By W. E. Britton and P. J. Anderson:

Tobacco Insects in 1926, Tobacco Station Bulletin, 8, page 52T, 3 pages, April, 1927.

By Philip Garman:

The Problem of Curculio Control in Connecticut Apple Orchards. Journal Economic Entomology, Vol. 20, page 196, February, 1927.

The Oriental Peach Moth in Connecticut and Results of Control Work in 1926. Proceedings 36th Annual Meeting Connecticut Pomological Society, page 46, April, 1927.

Feeding Habits Among Insects and Their Relation to Control Measures. American Produce Grower, Vol. II, No. 4, pages 3 and 26, April, 1927.

The Odonata or Dragonflies of Connecticut, Bulletin No. 39, State Geological and Natural History Survey, 331 pages, 67 figures, 22 plates; 3,000 copies, July, 1927.

By R. B. Friend:

The Birch Leaf Skeletonizer, *Bucculatrix canadensisella* Chambers (Bulletin 288), 94 pages, 29 figures, 2 plates; 2,500 copies, June, 1927.

The Spruce Gall Aphid (*Adelges abietis* Linn.) and Its Control, 6 pages, 4 plates (reprinted from the Report); 1,000 copies, April, 1927.
The Asiatic Beetle, *Anomala orientalis* Waterh. Journal Economic Entomology, Vol. 20, page 362, April, 1927.

By J. Peter Johnson:

Soil Treatment and Scouting for the Control of the Asiatic Beetle. Journal Economic Entomology, Vol. 20, page 373, April, 1927.

By M. P. Zappe:

Spraying Practices. Proceedings 36th Annual Meeting Connecticut Pomological Society, page 23, April, 1927.

By R. C. Botsford:

Results Obtained in Anti-Mosquito Work in Connecticut in 1926. Proceedings 14th Annual Meeting of the New Jersey Mosquito Extermination Association, page 115, 4 pages, June, 1927.

INSECT PEST ACCOUNT

Report of Receipts and Expenditures of the State Entomologist

From July 1, 1926 to June 30, 1927

Receipts

Insect Pest Appropriation, biennial period ending June 30, 1927	$35,000.00	
Additions, miscellaneous receipts*	50.68	
Deficiency appropriation, Board of Control and General Assembly of 1927	13,500.00	
	$48,550.68	
Expended to July 1, 1926	22,108.11	
Balance available, July 1, 1926		$26,442.57

Disbursements

Salaries	$15,570.31
Labor	2,567.96
Stationery and office supplies	101.62
Scientific supplies (chemicals)	34.79
" " (other laboratory supplies)	32.21
" " (photographic)	43.58
Feeding stuffs	.55
Insecticides, etc.	2,586.60
Lumber and small hardware	9.48
Fuel oil	459.53
Miscellaneous supplies	175.86
Automobile oil	38.38
Telephone and telegraph	69.36
Postage	96.95

Travel (outlying investigations)	715.72	
" (meetings, conferences, etc.)	259.95	
" (gasoline for automobiles)	427.25	
Freight, express and parcel post	149.00	
Publications (zinc cut)	2.50	
Coal	5.10	
Electricity	4.00	
Water	34.60	
Furniture and fixtures (new)	112.85	
" " " (repairs)	3.47	
Library (books and periodicals)	45.21	
Scientific equipment (new)	143.06	
" " (repairs)	3.50	
Tools, machinery and appliances (new)	960.98	
" " " " (repairs)	41.65	
Automobiles (repairs)	475.86	
New buildings and structures	9.91	
Buildings (repairs and alterations)	16.04	
Rent of land and building	416.63	
Insurance (automobile)	225.41	
Miscellaneous contingent expenses	202.70	
Total disbursements		$26,442.57

* Use of automobiles at 6 cents per mile	$42.48
Sale of honey	8.20
	$50.68

DEPARTMENT STAFF AND WORK

W. E. Britton, Ph. D., *State and Station Entomologist.*

B. H. Walden, B.Agr., *Photographic and General Work*
M. P. Zappe, B.S., *Inspection and General Work*
Philip Garman, Ph.D., *Research Work*
Roger B. Friend, Ph.D., *Research Work*
} *Assistant Entomologists.*

J. Peter Johnson, B.S., *Deputy in Charge of Asiatic and Japanese Beetle Quarantines.*

John T. Ashworth, *Deputy in Charge of Gipsy Moth Work.*

James A. McEvoy, *Assistant in Gipsy Moth Work.*

Robert C. Botsford, *Deputy in Charge of Mosquito Work.*

Miss Grace A. Foote, B.A., *Secretary.*

H. W. Coley, Westport
A. W. Yates, Hartford
} *Apiary Inspectors.*

Mr. Walden has continued to serve as chief photographer, has had charge of exhibits for the department, has been in charge of the office during the absence of the Entomologist, and has assisted in scoring fruit and in the general work of the department. He has also continued his researches on the imported currant worm, *Pteronidea ribesi* Scop.

Mr. Zappe has continued in charge of the inspection of nursery stock, and of the clean-up work around infestations of the European corn borer, in co-operation with the Federal Bureau of Ento-

mology. He has collaborated with Dr. Garman in the study of the plum curculio in apple orchards, and with Mr. E. M. Stoddard of the Botany Department, in dusting and spraying experiments in apple orchards.

Dr. Garman has continued his studies on the life history and control of the Oriental peach moth, *Laspeyresia molesta* Busck. In co-operation with Mr. Zappe, he has also continued the investigations of the plum curculio, *Conotrachelus nenuphar* Hbst., in apple orchards begun in 1923. Dr. Garman has kept in touch with the European red mite situation and with the chemistry of insecticides. He has also given much of his time to revising the manuscript and reading the proof of his paper on *The Odonata or Dragonflies of Connecticut,* which has been published during the year as Bulletin No. 39 of the State Geological and Natural History Survey.

Dr. Friend has completed graduate work in Yale University and received the degree of doctor of philosophy in June. His thesis was "The Biology of the Birch Leaf Skeletonizer, *Bucculatrix canadensisella* Chambers," and was published during the summer as Bulletin 288 of this Station. Dr. Friend has also been in charge of the investigations on the life history and habits of the Asiatic beetle, *Anomala orientalis* Waterhouse, which are now nearly complete, and the results are being co-ordinated and tabulated for publication. He has also given some time to a study of the methods of control of certain insect pests of vegetable crops, and to the life history of the birch leaf miner, *Fenusa pumila* Klug.

Mr. John T. Ashworth has continued to serve as deputy in charge of gipsy moth work with headquarters at Danielson. He has been assisted by Mr. James A. McEvoy, and, as in former years, the work has been conducted with vigor and efficiency in co-operation with the Federal Bureau of Entomology.

Mr. Robert C. Botsford has continued to serve as deputy in charge of mosquito elimination work and has supervised important new ditching projects in Westport and Westbrook besides maintaining the ditches in the other areas accepted for State maintenance.

Mr. J. Peter Johnson has been in charge of the quarantine and soil treatment work against the Asiatic beetle, and of the Federal and State quarantines against the Japanese beetle. Mr. Johnson is an agent of the Federal Bureau of Entomology, and from June 15 to December 31, maintained an office in Stamford, with a force of men sufficient to make the necessary inspections, issue certificates, and patrol all the principal highways leading northward and eastward out of the quarantined area.

Mr. B. W. McFarland has been employed throughout the season to assist in the Asiatic beetle work, and Mr. Charles R. Biecher assisted in the insectary from June 1 until September 1.

Mr. J. Leslie Rogers was employed from June 12 to September 20, when he returned to college. He and Messrs. J. F. Townsend, A. P. Harger, and H B. Bender assisted Mr. Zappe in nursery inspection between July 1 and October 1. Mr. Townsend worked scouting for the Asiatic beetle and also on the corn borer clean-up operations.

Messrs. A. W. Yates, Hartford, and H. W. Coley, Westport, have served as apiary inspectors as in former seasons, on a *per diem* basis.

Miss Grace A. Foote has served as secretary throughout the year. During the vacation period, Miss Helen N. Fox was employed to do the necessary work of the office.

The Entomologist here desires to express his appreciation of the earnest, faithful, and efficient efforts of all members of the department staff. Without such service the work could not have been done.

The Entomologist has continued to direct the work of the department and has given his personal attention to the office correspondence. During the year he has been made responsible for the conduct of the mosquito elimination work, with Mr. Botsford in immediate charge. He has also continued to serve as Associate Editor of the *Journal of Economic Entomology,* and as Insect Pest Reporter in Connecticut for the Insect Pest Survey of the Bureau of Entomology. He is also Chairman of the Tree Protection Examining Board, and Superintendent of the Geological and Natural History Survey of Connecticut and has devoted some of his time to these matters.

The chief activities of the department are described in some detail in the following pages of this Report.

ENTOMOLOGICAL FEATURES OF 1927

The season of 1927 was a peculiar one in many respects. Spring and early summer were cool, with rather light rainfall. A few hot days came in July, and the precipitation was abundant in July, August, and September. In general, aphids were unusually abundant on all kinds of trees and plants—more abundant than in any season within the memory of the Entomologist.

Fruit Insects

Though not particularly prevalent in orchards in May and June, the green apple aphid, *Aphis pomi* De G., later became so very abundant that it attacked and injured the fruit. Specimens of this aphid were received from Woodmont, Windsor, and Litchfield, and it was found in 36 nurseries at the time of the annual inspection. The rosy apple aphid, *Anuraphis roscus* Baker, was rather

scarce in the orchards visited until about July 1, when it was found to have increased rapidly. This insect was sent to the Station from Westport and West Haven. The observations made in Connecticut orchards by Messrs. Zappe, Stoddard, and Dr. Garman, indicate that lady beetles and Syrphid flies were present in nearly all cases and were expected to control the aphids, but for some unknown reason failed to hold them in check.

The woolly apple aphid, *Eriosoma lanigerum* Hausm., was present as usual in orchards and nurseries, and was sent to the Station from Hamden, June 15, from New Haven, June 16 and 20, and was observed in 43 nurseries.

Work of the currant aphid, *Myzus ribis* Linn., was received from West Cornwall, June 22, from Litchfield, July 7, and was observed in five nurseries. The cherry aphid, *Myzus cerasi* Fabr., was sent in from Wallingford, July 12, and was likewise observed in five nurseries. The mealy plum aphid, *Hyalopterus arundinis* Fabr., was prevalent on European plum but did not infest the Japanese plum.

Leafhoppers were extremely abundant on apple during the season and undoubtedly caused considerable injury both in orchards and nurseries. Though several species are probably involved, generally the most abundant kind in the orchard is the rose leafhopper, *Empoa rosae* Linn., and the predominant one in nurseries is the apple leafhopper, *Empoasca mali* Le B. Though not specifically identified in all cases, leafhoppers seemed to be more abundant than usual and caused the mottling of leaves in many apple orchards. They were also present on apple stock in 60 nurseries.

The pear psylla, *Psylla pyricola* Först, was also abundant on pear trees. It was received from New Haven, North Haven and Litchfield, and observed in 24 nurseries. The first adult was observed by Mr. Stoddard on March 16. A dormant spray of lime-sulphur (1-9) with nicotine in spring is probably the best treatment to kill the eggs. Summer sprays of nicotine and soap may be necessary to hold the insect in check and to clean up the fruit.

The San José scale, *Aspidiotus perniciosus* Comst., was not particularly prominent during the season. It was received only once at the Station (from Danbury) and was found in 16 nurseries.

The European red mite, *Paratetranychus pilosus* C. & F., seems to be on the increase in Tolland County and probably throughout the State. Specimens were received from Nichols and Glastonbury, and the pest was observed in many orchards and in 11 nurseries. Spraying the dormant trees with a miscible oil is the best treatment to kill the eggs.

The pear leaf blister mite, *Eriophyes pyri* Pagnst., was rather prevalent, having been received at the Station twice from New Haven, and found in 39 nurseries.

The apple and thorn skeletonizer, *Hemerophila pariana* Clerck, was seemingly more abundant than in 1925 and 1926. During the last two months the adults have been rather common, resting on window screens around New Haven. This insect was found in 22 nurseries. It is easily controlled by spraying with lead arsenate.

The fall cankerworm, *Alsophila pometaria* Harris, which is always locally abundant, was present in moderate numbers in New Haven and Hamden, and was received from Westport, Colchester, and East Lyme. A fairly large area at "Point O' Woods" in East Lyme was almost completely defoliated, including fruit trees and the native growth in woodland and along the roadside. The caterpillars died in large numbers from a wilt disease, and a large native ground beetle, *Calosoma scrutator* Fabr., fed upon the cankerworms.

The Eastern tent caterpillar, *Malacosoma americana* Fabr., was very abundant over the greater portion of the State. Specimens were received from West Haven, Waterbury, and Middletown. Many caterpillars when nearly full grown carried the eggs of Tachinid parasites, and thousands died from a wilt disease. It is almost certain that this insect will continue to decrease during the next few years.

The fall webworm, *Hyphantria cunea* Drury, was present in usual abundance throughout the State, and the nests could be seen on all kinds of fruit, shade and woodland trees, in late summer.

The codling moth, *Carpocapsa pomonella* Linn., was present throughout the State as usual, and was sent in from Danbury. The plum curculio, *Conotrachelus nenuphar* Hbst., was perhaps rather more troublesome than usual, and specimens were received showing injury to peach from South Britain, and to apple from Danbury and West Haven. Both these insects are best controlled by frequent applications of lead arsenate. Other leaf feeders on apple received from correspondents are: the white-marked tussock moth, *Hemerocampa leucostigma* S. & A., from Shelton, and on raspberry from Bristol; the red-banded leaf roller, *Eulia velutinana* Walker, from Plantsville; the apple bucculatrix, *Bucculatrix pomifoliella* Clem., from Shelton; the yellow-necked caterpillar, *Datana ministra* Drury, from Plantsville and Old Lyme; the red-humped caterpillar, *Schizura concinna* S. & A., from Hamden; the green fruit worm, *Xylina antennata* Walker, from New Haven; the bud moth, *Tmetocera ocellana* Schiff., from Danbury, and the snow-white linden moth, *Ennomos subsignarius* Hubn., from Glastonbury.

The Oriental peach moth, *Laspeyresia molesta* Busck, is now distributed throughout the State, and there seems to have been a general increase in Fairfield, New Haven, and Hartford Counties. Larvae in quince were received from Middletown in October. There seems to be no satisfactory control for this insect.

The pear midge, *Contarinia pyrivora* Riley, has been prevalent in certain localities. We have observed it in New Haven, and specimens were received from Norwalk and Rockville in June. The pear slug or sawfly, *Eriocampoides limacina* Retz., has been very abundant on pear and cherry in orchards, and was found in 24 nurseries.

The apple maggot, *Rhagoletis pomonella* Walsh, has been rather more abundant than usual, especially in New Haven and Tolland Counties, and was not wholly controlled by careful spraying.

The European fruit scale, *Lecanium corni* Bouché, was received from Wethersfield in June on Japanese plum. The raspberry sawfly, *Monophadnoides rubi* Harris, was very abundant locally, and small plantations in Hamden and West Haven were entirely defoliated in June.

There has been no prominent increase in the spread of the gipsy moth, *Porthetria dispar* Linn., though a small infestation was discovered in Woodbridge and another in Oxford. The towns of Goshen and Litchfield have been removed from Federal and State quarantine. No noticeable defoliation has occurred in Connecticut, though more than 130,000 acres of woodland in Massachusetts, and about 5,000 acres each in New Hampshire and Maine were stripped by the caterpillars in 1927.

The Japanese beetle, *Popillia japonica* Newm., which was discovered in Connecticut at Stamford, in September, 1926, has now reached Bridgeport, where several hundred beetles, well distributed over the city, were found by Federal scouts.

Vegetable Insects

I am indebted to Prof. A. E. Wilkinson for much of the data regarding vegetable insects used in the following pages:

Cutworms were more than usually troublesome all through the State on a variety of crops, causing damage estimated to be from 5 to 25 per cent in various localities. There are several different species of cutworms, all being the larvae of noctuid moths and varying somewhat in their habits. We have not had material for identification so cannot be certain of the species responsible for the injury. In one instance, however, in a greenhouse in Danbury, April 7, carnations had from two to five cutworms per plant, and we are safe in ascribing this damage to the variegated cutworm, *Lycophotia margaritosa saucia* Hbn., which has the habit of climbing, and eating holes in the buds, often causing much damage to plants under glass. Other kinds of cutworms are present in the open field, and we have records of injury as follows: to peas, Thomaston, May 6; to cabbage and early cauliflower, Stratford, May 3, Thomaston, May 6; Lebanon, Black Hall, Groton, and South Windsor, May 11; Southington and Farmington, May 13;

Hampton, Danielson, Brooklyn, Canterbury, Wauregan, Pomfret Center, May 17; Putnam, Woodstock, East Woodstock, May 18; to asparagus, Norwich, May 12, and Southington, May 13; to peppers, Plainville, May 13; to beets and tomatoes, Woodstock and Putnam, May 18. At a meeting at Hartford on May 12, twelve men asked for cutworm remedies; they were from Burnside, Wapping, East Hartford, West Avon, Rocky Hill, Wethersfield, and Windsor. Cutworms were present in all house gardens at Storrs, June 2. On May 20, specimens were received from Mystic of the larvae of *Feltia venerabilis* Walker, another of the climbing cutworms which does not cut off the stem. These larvae were feeding upon various vegetable plants. In such a case, spraying with lead arsenate is the remedy. For those kinds that cut off the stems, it is best to distribute some poisoned bait around the field several days before the plants are set, or before the seedlings reach the size to be injured. A formula for this bait is as follows:

Wheat bran	5 lbs.
White arsenic or Paris green	4 oz.
Cheap molasses	1 pint
Orange or lemon	1 fruit
Water	7 pints

Cut the fruit into small pieces and mix all together to form a rather dry mash, and scatter around the field. Mr. Peckham wrote that cutworms bothered him so little that he never reset a plot of any transplanted crop on account of them.

The Colorado potato beetle, *Leptinotarsa decemlineata* Say, seems to have been very abundant in some localities and very scarce in others. Severe injury was reported in four fields at Westport, July 6, two fields at Brookfield, and one field at East Danbury, July 7. Certain fields in Hamden were quite free from attack. Of course spraying or dusting with lead arsenate is the remedy.

The striped cucumber beetle, *Diabrotica vittata* Fabr., was troublesome on cucumbers, squashes and melons at the Station farm at Mount Carmel. They were reported as injuring melons and early squash at Cannondale, July 7, where from two to four leaves had been injured in every hill; also early squash at Westport and Ridgefield, and cucumbers at Westport, July 6 and 7. They may be controlled by a spray of lead arsenate and Bordeaux mixture, by a dust of calcium arsenate and lime or by one of the fluosilicates.

Asparagus beetles, *Crioceris asparagi* Linn., and *C. 12-punctata* Linn., were as abundant as usual. They were reported as few from Norwich and Pawcatuck, May 11, and Southington, May 13. They were reported as abundant and causing considerable damage at Westport, July 6, and at Ridgefield, July 7. In my own garden,

I was able to kill the grubs readily by a spray of Black Leaf 40 (2 teaspoons in a gallon of water).

The green cabbage worm, *Pontia rapae* Linn., was present in the usual abundance and was reported from Westport, Ridgefield, and East Danbury on July 7. It was also plentiful in Hamden.

Reports were few regarding injury by the cabbage maggot, *Hylemyia brassicae* Bouché. An acre field of cabbage and cauliflower at Westport, July 6, showed about 60 per cent injury, and some injury to cabbage and cauliflower was reported from Cheshire as early as May 31. There were 150,000 plants around New Haven, with a loss of 60 per cent on account of the cabbage maggot.

The zebra caterpillar, *Mamestra picta* Harris, was found feeding upon cabbage leaves at Westport, July 6.

The garden flea hopper, *Sminthurus hortensis* Fitch, caused considerable injury to young seedlings. On April 21, the hoppers injured tobacco plants in frames at Hockanum, and May 4, vegetable plants in frames at Westport. They also attacked spinach, lettuce, beans, and cucurbits at the Station farm at Mount Carmel. They were easily controlled by dusting with lead arsenate.

The gray field slug, *Limax agrestis* Linn., was received from Middletown, July 7.

The seed corn maggot, *Hylemyia cilicrura* Rond., was received from Franklin July 21, where it caused injury to potato. Many fields of early sweet corn had to be planted over, and in some cases, planted over twice on account of this insect. The margined blister beetle, *Epicauta marginata* Fabr., feeding on potato in New Haven, was sent to the Station July 26.

The carrot rust fly, *Psila rosae* Fabr., is present in Connecticut. Parsnips injured by this insect were received from Winsted, March 25, and others were dug from my own garden at nearly the same date. No good means of control can be recommended. The squash borer, *Melittia satyriniformis* Hubn., was present as usual and caused considerable injury. Specimens were received from West Haven, August 8. At the Station farm at Mount Carmel, Dr. Friend was able to obtain a good crop of Hubbard squashes by the method of cutting out the borers and covering the vines so that they could make new roots.

The stalk-borer, *Papaipema nitela* Guen., was very common, and though it may burrow in any herbaceous stem, nearly all specimens sent to the Station were in corn. The records follow: Trumbull, July 6; Hamden, July 21; Higganum, July 23; South Britain, July 25; Salem, July 28; Clintonville, August 9; Pomfret, August 19. Little can be done for the control of this pest other than to destroy each borer when discovered.

The corn ear worm, *Heliothis obsoleta* Fabr., was reported only a few times and evidently was less abundant than in some seasons.

One grower reported finding it on his corn much earlier in the season than he had ever seen it before.

The onion maggot, *Phorbia ceparum* Meigen, was reported as causing 20 per cent injury to sets in Westport, July 6. On the same date a field of sets in Westport showed that the onion thrips, *Thrips tabaci* Lindeman, had just begun to cause injury.

Aphids on carrots and parsnips were reported from Westport on July 6, and on carrots and beets from Brookfield and East Danbury on July 7. As specimens were not received or identified, the specific nature or names of the aphids cannot be given. Mr. Peckham reports a total loss of two acres of young carrots from aphid attack and the yield from three acres of parsnips reduced 50 per cent.

The potato aphid, *Macrosiphum solanifolii* Ashm., was sufficiently abundant to curl the leaves of potato at Westport July 6 and probably the same species on tomato was observed at Cannondale July 7. Reports were received of this aphid on potato at Milford, July 19, and later from Middletown, Canterbury, Hebron, Hartford, East Hartford, Wethersfield, and Norwich.

The spinach aphid, *Myzus persicae* Sulz., was also abundant on nearly all kinds of truck crops. Aphids were reported from Norwich as attacking ruta bagas but the plants were not seriously injured by them.

These aphids can all be controlled artificially by nicotine applied either as a spray or as a dust. Treatment at the right time may be profitable on certain crops, but in other cases the treatment may cost more than the value of the crop, or the plants may have been so seriously injured before treatment that they do not recover. Consequently treatment cannot be recommended in all cases, but depends upon conditions, and the final decision whether or not it will pay to spray or dust must rest with the grower.

The pea aphid, *Illinoia pisi* Kalt., caused much injury to peas in various portions of the State. Damage varying from 15 to 20 per cent was reported by Mr. Wilkinson from Westport, Ridgefield, and East Danbury, on July 7.

Shade and Forest Tree Insects

The fall canker worm, *Alsophila pometaria* Harris, has already been mentioned under "Fruit Insects" as being unusually abundant at "Point O' Woods," East Lyme, where the native woodland growth was almost completely stripped of leaves over a small area.

The fall webworm, *Hyphantria cunea* Drury, has also been mentioned under "Fruit Insects" as occurring in usual numbers throughout the State. Specimens were received from Lyme, August 13, and from New Haven, August 18. It was also ob-

served in many portions of the State but particularly in Granby and Putnam.

The elm leaf beetle, *Galerucella xanthomelaena* Schrank, was not so prevalent as usual, though some feeding by the larvae was noticed on small trees in New Haven. Specimens were received from New Haven, July 18, and from Norwich, August 2. As there was abundant moisture during the time of pupation in both 1926 and 1927, there was ample opportunity for the white fungus to attack the pupae, and probably the elm leaf beetle will not be prominent in 1928.

The European elm case bearer, *Coleophora limosipennella* Dup., was received from Norwich, August 2. The small caterpillars make rectangular mines in the leaf, and these areas turn brown, giving the leaves a spotted appearance. Spraying with lead arsenate is probably the best remedy.

The birch skeletonizer, *Bucculatrix canadensisella* Chamb., was less abundant in 1927 than in 1926, and is apparently on the wane, though the larvae were present on birch trees around New Haven. No trees were observed which had turned brown from its attack.

The imported birch leaf miner, *Fenusa pumila* Klug, was present throughout the State and was observed in New Haven, Hamden, Southbury, Woodbury, Sherman and Granby. Specimens were received from New Haven, August 17.

The leopard moth, *Zeuzera pyrina* Linn., is frequently observed in shade trees, though not nearly as destructive as it was fifteen years ago. Specimens were received from East Haven, November 14.

The white-marked tussock moth, *Hemerocampa leucostigma* S. & A., was present as usual throughout the State, though not especially abundant. Specimens were received from New Haven, August 1.

The white pine weevil, *Pissodes strobi* Peck, was present in usual numbers throughout the State and killed the leaders of many young white pine trees growing in sunny places. Trees growing under shade are less apt to be injured. Specimens were received from Stafford Springs, September 10.

Pine sawflies were observed in a number of cases. Specimens of the imported pine sawfly, *Diprion simile* Hartig, were received from New Haven, September 15, on Scotch pine. Another species, *Neodiprion pinetum* Norton, was received from Mount Carmel, October 8. Spraying with lead arsenate is the remedy.

Specimens of the pitch-mass borer, *Parharmonia pini* Kellicott, were received from Farmington, September 30. It seldom causes serious injury, and no practical method of control has been discovered.

The European pine shoot moth, *Rhyacionia buoliana* Schiff., is apparently spreading in the State and is found chiefly on red pine.

What seemed to be this pest was received from Stafford Springs, September 27, and from Rainbow, November 23.

Another pine insect, *Tetralopha robustella* Zell., on red pine, was received from New Haven, September 29. The larvae are brown, striped lengthwise with darker brown, and they live in silken tubes in globular masses of frass. The masses are sometimes two inches or more in diameter. This insect is regarded as being somewhat rare, and can hardly be considered a pest.

The locust leaf miner, *Chalepus dorsalis* Thunb., was more abundant than usual, and black locust and rose acacia throughout the State had the leaves mined by the larvae. These leaves afterward turned brown as though scorched by a fire. This injury was more noticeable in Windham County than elsewhere.

The imported willow leaf beetle, *Plagiodera versicolora* Laich., was received from Greenwich, September 10. This insect has now spread throughout the State and willow leaves are skeletonized by the larvae. A spray of lead arsenate is the remedy.

The poplar and willow curculio, *Cryptorhynchus lapathi* Linn., was received from New Haven, June 7. The larvae were very abundant in some large "pussy willows" growing in the back yard. The trees were ruined.

Girdled pine twigs were received from Eastford, May 16. Apparently this was the work of the pales weevil, *Hylobius pales* Herbst.

The terrapin scale, *Lecanium nigrofasciatum* Perg., on the small twigs of silver maple, was received from Waterbury, October 26.

The tulip tree scale, *Toumeyella liriodendri* Gmel., is common on the lower branches of the tulip tree, sometimes killing the branches. Specimens were received from Hamden, July 26, and from Middlebury, October 26. The young are hatched in September and may easily be killed by a spray of lime-sulphur or a miscible oil applied as soon as the leaves drop.

The European lecanium, *Lecanium corni* Bouché, a species now common in the United States, infesting nearly all kinds of trees and shrubs, was received from Hazardville, June 21, on oak.

The pit-making oak scale, *Asterolecanium variolosum* Ratz., a species imported from Europe and usually found on golden oak, *Quercus robur,* in nurseries, or planted on private grounds, was received March 12 from Woodbridge, on the native chestnut oak.

The somewhat rare spruce bud scale, *Physokermes piceae* Schr., was received from Kensington, June 7.

The elm scale, *Gossyparia spuria* Modeer, continues to be prevalent on young trees, and is found in nurseries. Specimens were received from New Haven, June 27.

One of the oak gall scales, *Kermes* sp., was received from New Haven, July 25, and was found to be quite abundant on oaks in one nursery.

The pine leaf scale, *Chionaspis pinifoliae* Fitch, was received from Hartford, January 21, and from Norwalk, September 19.

The spruce gall aphid, *Adelges abietis* Linn., is very prevalent on Norway spruce trees in nurseries, ornamental and forest plantings. Specimens were received from New Haven, April 13; Southington, April 16; Winsted, June 4; Avon, July 2, and Naugatuck, July 6. Another species which may be called the blue spruce gall aphid, *Gillettea cooleyi* Gillette, makes large galls on the Colorado blue spruce. Specimens were received from Thompson, May 28. A variety of the latter, known as *Gillettea cooleyi* var. *coweni* Gillette, infests Douglas fir but does not form galls. Specimens were received from Middlebury, July 2.

The larch woolly aphid, *Adelges strobilobius* Kalt., was received from Danbury, July 6. The pine bark aphid, *Adelges pinicorticis* Fitch, was received from Derby, May 1, and Hamden, June 1. Both of these insects are woolly aphids and do not form galls, though closely related to the gall-forming species.

Aphids were exceedingly abundant on nearly all kinds of trees and shrubs. The beech woolly aphid, *Phyllaphis fagi* Linn., was received from Milford, June 17. In general, a nicotine spray is perhaps the best method of controlling aphids.

The spruce mite, *Paratetranychus ununguis* Jacobi, is the cause of much injury to spruce and other conifers, and seems to be increasing in prevalence. Specimens were received from Old Lyme, July 9. One of the best remedies is to spray thoroughly with linseed oil emulsion.

The maple leaf bladder gall, *Phyllocoptes quadripes* Shimer, is common on leaves of the silver maple, and specimens were received from Norwalk, May 23, Hamden, May 31, and Danbury, June 23. Spraying the dormant trees in early spring with lime-sulphur is a remedy.

Insects Attacking Ornamental Shrubs and Plants

Aphids were abundant on nearly all kinds of ornamental plants during the summer.

The juniper webworm, *Dichomeris marginellus* Fabr., caused injury to low junipers here and there, and specimens were received from Cheshire, April 19. Spraying heavily with lead arsenate is the remedy.

The abbot sphinx, *Sphecodina abbotii* Swain., was observed in several localities, the larvae feeding upon Virginia creeper. Specimens were received from Cos Cob, July 23, and from New Haven and Putnam, August 2. Hand picking is the usual method of control, but a spray of lead arsenate will protect the vines from being defoliated.

The stalk borer, *Papaipema nebris* Guen., which has been mentioned under vegetable insects, is also injurious to dahlia, lily, larkspur, hollyhock, and other herbaceous stems. Specimens in dahlia were received from South Kent, August 4.

The iris borer, *Macronoctua onusta* Grote, was present in about the usual numbers. The Entomologist found it in his own garden, and specimens were received from Old Saybrook, July 6. The remedy is to gather and burn the old leaves in late fall or early spring, to kill the eggs.

The black vine weevil, *Brachyrhinus* (*Otiorhynchus*)*sulcatus* Fabr., caused some injury to Taxus plants in a nursery at New Canaan where it was observed on August 10. The larvae feed upon the roots and on this date the adults were emerging and were feeding somewhat upon the leaves.

Serious injury to boxwood by the boxwood leaf miner, *Monarthropalpus buxi* Labou., was reported from Westport, on June 13. The adults were just emerging. One of the best remedies seems to be molasses and nicotine solution, using cheap molasses, one part in four parts water, and adding nicotine sulphate at the rate of one part in 500 parts of the spray material. The first application should be made at the time the first adult flies emerge, and the foliage should be kept covered for three weeks, spraying after each rain and directing the spray against the under side of the leaves. An application once each week is sufficient in fair weather.

The strawberry leaf roller, *Ancylis comptana* Frölich, was very abundant and caused injury to roses in many localities in the State. Unopened buds and tender leaves were eaten by the larvae during June and July. In some gardens around New Haven, a large proportion of the rose buds were injured by this insect. Probably spraying with lead arsenate would be effective.

The common red spider, *Tetranychus bimaculatus* Harvey, was quite prevalent on hardy phlox during the summer and caused the leaves to turn yellow and later many turned brown and dropped. Specimens were received from Old Saybrook, July 6, East Haven, July 7, and Plainfield, July 16. In severe cases it may be advisable to underspray with linseed oil emulsion.

The cyclamen mite, *Tarsonemus pallidus* Banks, continues to be a troublesome pest in garden and greenhouse. It attacks cyclamen, snapdragon, and chrysanthemum in the greenhouse and injures larkspur and garden balsam, *Impatiens Balsamina*, in the flower garden. Specimens on larkspur were received from East Haven on August 11. This pest may be controlled, though perhaps not wholly eradicated, by spraying twice a week until the plants blossom with nicotine solution, one part in 500 parts water, with a little soap added.

The rhododendron lace bug, *Leptobyrsa rhododendri* Horvath, was received from Norfolk, September 29. This insect is now

rather prevalent on rhododendron and mountain laurel, and sucks the sap from the under sides of the leaves. The remedy is to spray with nicotine solution and soap soon after the young nymphs appear.

Miscellaneous Insects

The Asiatic beetle, *Anomala orientalis* Waterhouse, still exists in the Westville section of New Haven, though the pest has been greatly reduced by the soil treatment. It has developed during the past season in certain lawns not injured heretofore. As the insect is rather abundant in Westchester County and on Long Island, New York, the idea of eradicating it from New Haven seems less important than formerly when the local area was the only known infestation in the United States. The eradication program, on account of its great cost, will probably be modified toward a plan of experiment and control.

A species of silver fish or bristle-tail, *Thermobia domestica* Pack., causes considerable damage in dwelling houses, particularly by eating the paste from book covers. Specimens were received from Greenwich, October 24.

The European hen flea, *Ceratophyllus gallinae* Schrank, caused considerable discomfort by biting human beings in Madison. This is the first record of the occurrence of this insect in Connecticut, though it has been recognized in other states and is probably widely distributed in this country. The matter is discussed more fully on another page of this report.

Convention of Entomological Workers

The fourth annual convention of entomologists working in Connecticut was held at the Station on Friday, November 4, 1927. The program was similar to those of preceding conventions and included subjects of vital interest to Connecticut entomologists. Those from outside the State who gave papers or addresses were: Dr. H. C. Huckett, Riverhead, N. Y., A. F. Burgess, Melrose Highlands, Mass., D. W. Jones, Arlington, Mass., J. L. King, Moorestown, N. J., and Professor C. C. Hamilton, New Brunswick, N. J. About 43 attended this meeting. Luncheon was obtained at the Yale Dining Hall. The program was as follows:

Program

A. M.

10:00 Greeting.
W. L. Slate, Director Experiment Station, New Haven.
10:15 Present Organization of Entomological Work in Connecticut.
Dr. W. E. Britton, New Haven.
10:30 A Contribution to Our Knowledge of Cucumber Beetles.
Dr. H. C. Huckett, Riverhead, N. Y.

10:45 Notes on the Life History of the Asiatic Beetle.
Dr. R. B. Friend, New Haven.
11:00 A General Survey of Gipsy Moth Conditions.
A. F. Burgess, Melrose Highlands, Mass.
11:40 Gipsy Moth Conditions in Connecticut.
John T. Ashworth, Danielson.
11:50 Spread of the European Corn Borer and the Establishment of Imported Parasites.
D. W. Jones, Arlington, Mass.
12:30 Present Status of the European Corn Borer in Connecticut.
M. P. Zappe, New Haven.

P. M.

12:45 Luncheon.
2:00 The Japanese Beetle and the Parasites Which Have Been Established in This Country.
J. L. King, Moorestown, N. J.
2:45 Japanese Beetle Conditions in Connecticut.
J. Peter Johnson, New Haven.
3:00 Some Notes on the Life History, Habits, and Methods of Control of *Aserica castanea*.
Prof. C. C. Hamilton, New Brunswick, N. J.
3:45 The Plum Curculio in Connecticut Apple Orchards.
Dr. Philip Garman, New Haven.
4:00 Mosquito Elimination Work of the Season in Connecticut.
R. C. Botsford, New Haven.

The following were present: John T. Ashworth, Danielson, Conn.; C. H. Batchelder, Arlington, Mass.; George R. Biecher, West Haven, Conn.; H. L. Blaisdell, Melrose Highlands, Mass.; R. C. Botsford, New Haven, Conn.; A. I. Bourne, Amherst, Mass.; W. E. Britton, New Haven, Conn.; A. F. Burgess, Melrose Highlands, Mass.; W. A. Collins, New Milford, Conn.; I. D. Dobroscky, Yonkers, N. Y.; W. O. Filley, New Haven, Conn.; R. B Friend, New Haven, Conn.; Philip Garman, New Haven, Conn.; C. C. Gillette, Storrs, Conn.; Harold C. Hallock, Westbury, N. Y.; C. C. Hamilton, New Brunswick, N. J.; Mr. and Mrs. Albert Hartzell, Yonkers, N. Y.; H. W. Hicock, New Haven, Conn.; August E. Hooghkirk, New Haven, Conn.; Mr. and Mrs. J. L. Horsfall, Yonkers, N. Y.; H. C. Huckett, Riverhead, N. Y.; Mr. and Mrs. D. W. Jones, Arlington, Mass.; J. Peter Johnson, New Haven, Conn.; G. H. Lamson, Jr., Storrs, Conn.; J. L. King, Moorestown, N. J.; J. A. Manter, Storrs, Conn.; S. E. May, Canaan, Conn.; J. A. McEvoy, Putnam, Conn.; B. W. McFarland, New Haven, Conn.; W. B. Mix, Greenwich, Conn.; W. D. Munson, South Britain, Conn.; R. C. Newton, Storrs, Conn.; O. C. Otis, Winsted, Conn.; C. C. Plummer, Storrs, Conn.; F. C. Rich, Ansonia, Conn.; Milton E. Rydberg, Yonkers, N. Y.; J. F. Townsend, New Haven, Conn.; B. H. Walden, New Haven, Conn.; R. A. Vickery, Stratford, Conn.; M. P. Zappe, New Haven, Conn.

INSPECTION OF NURSERIES IN 1927

W. E. Britton and M. P. Zappe

The regular annual inspection of nurseries was commenced July 1 and finished in September, except for a few new nurseries which were inspected afterwards, the final inspection for 1927 being made

on December 2. As in former years, this work was in charge of Mr. Zappe, who was assisted by Messrs. J. L. Rogers, J. F. Townsend, A. P. Harger, and H. B. Bender. In a few cases assistance was rendered by E. M. Stoddard, B. H. Walden, John T. Ashworth, and W. E. Britton.

Mr. Bender is a botanist who was employed temporarily for the purpose, in order to give special attention to such plant diseases as might occur in the nurseries.

In addition to the inspections made by the nursery inspectors, the gipsy moth scouts were instructed to make careful examinations for gipsy moth eggs in and around all nurseries in the infested area, and in case any were found, to report at once to the office. No gipsy moth infestations were discovered in or near any nursery in 1927. Also the pine blister rust scouts under Mr. J. E. Riley examined all nurseries where the blister rust was reported by the nursery inspectors.

On the whole, the nurseries were in as good condition as usual except that aphids were unusually abundant and were present on many kinds of plants not usually found infested. Some nurserymen have not yet obtained satisfactory control of the spruce gall aphid, though each has been supplied with literature giving the life history of the insect and methods of treatment, based upon the experiments of Dr. R. B. Friend of this Station.

In 37 nurseries no important pests were found. Following is a list of insects and plant diseases found in nurseries during the annual inspection of 1927, together with the number of nurseries infested by each:

PESTS FOUND IN NURSERIES IN 1927

Number of nurseries uninfested 37

INSECTS

Name	No. Nurseries	Name	No. Nurseries
Aphids, apple, green	36	Aphids, on pear	4
woolly	43	pine	1
Aralia	11	plum	6
on ash	1	raspberry	1
birch	10	rose	8
cherry	5	spiraea	9
Crataegus	6	spruce	4
currant	5	sumac	2
elm	1	syringa	1
Euonymus	1	tulip tree	1
honeysuckle	1	*Viburnum*	4
hydrangea	1	walnut	2
larch	1	willow	6
lupine	1	spruce gall, *Adelges abietis*	64
maple	4	*Gillettea cooleyi*	18
mountain ash	9	larch woolly, *Adelges*	2
oak	2	pine bark	21
peach	1	woolly, on purple beech	1

Name	No. Nurseries
Apple and thorn skeletonizer	22
Birch leaf miner	34
Borer, bronze birch	2
in apple	1
ash	1
lilac	1
linden	1
poplar	9
rose	1
willow	4
Curculio, walnut	2
Currant worm, imported	4
Elm leaf beetle	4
European pine shoot moth	1
Fall webworm	15
Janus abbreviatus	3
Juniper webworm	16
Lace bug, on quince	1
rhododendron	32
Leafhoppers, on apple	60
boxwood	2
cherry	1
Crataegus	1
elm	1
lilac, Persian	1
maple	3
mountain laurel	2
pear	1
quince	1
rose	9
Leaf miner in alder	1
arborvitae	7
boxwood	5
Catalpa bungei	7
columbine	1
elm	1
magnolia	1
maple	2
Mealy bug on *Taxus*	1
Midge on silver maple	4
Mite, European red	11
pear leaf blister	39
spruce	43
on *Amelanchier*	1
arborvitae	11
ash	1
birch	1
box elder	1
Clethra alnifolia	1
fir	1
juniper	5

Name	No. Nurseries
Mite, on maple	4
oak	6
phlox	4
pine	1
plum	1
Mite, on *Retinospora*	2
walnut	1
willow	1
galls on buttonbush	1
Oriental peach moth	23
Pear psylla	24
slug	24
Pine tube moth	1
Poplar flea beetle, *Crepidodera helxines*	2
leaf beetle, *Lina scripta*	2
Red-humped caterpillar	4
Rose, leaf tyers on	1
Sawfly, imported, *Diprion simile*	6
Scale, elm	7
elm scurfy	3
euonymus	3
juniper	2
Lecanium on arborvitae	1
maple	1
oak	1
oak gall	1
oyster-shell	45
pine leaf	6
rose	8
San José	16
scurfy	1
terrapin	1
tulip tree	4
on magnolia	1
Retinospora	1
Shot-hole borer	1
Sphinx caterpillars	1
Spiny elm caterpillar	1
Spittle bug on arborvitae	1
juniper	2
Stalk borer	1
Tarnished plant bug	3
Tent caterpillar	1
Tulip tree leaf gall	1
White pine weevil	17
Willow curculio	1
leaf beetle, imported *Plagiodera versicolora*	11
Yellow-necked caterpillar	1

PLANT DISEASES

Name	No. Nurseries
Anthracnose on cherry	8
currant	24
grape	5
Apple scab	44
Black knot	1
rot on apple	49
cherry	1
quince	6
Brown rot	9
Canker, poplar	39
Crown gall	6
Fire Blight	6
Leaf blotch on rose	77
on *Ampelopsis*	1
spot on *Catalpa*	30
cherry	1
elm	2
horse chestnut	2
iris	11
linden	1
maple	7
—tar spot—	1
mountain ash	5
pear	1
phlox	15
Leaf spot on strawberry	24
Mildew on apple	31
Catalpa	33
cherry	1
dogwood	1
grape	32
honeysuckle	1
lilac	13
peach	2
pear	2
phlox	9
raspberry	1
Rhus canadensis	1
rose	35
Symphoricarpus	1
Raspberry cane blight	1
mosaic	21
Rust on apple	72
cedar	12
Crataegus	3
juniper	17
quince	5
willow	1
White pine blister, on *Ribes*	9

From an examination of the preceding list, it will be seen that of the insects, the spruce gall aphid was found in more nurseries (64) than any other, though followed rather closely by apple leafhoppers (60), oyster-shell scale (45), woolly apple aphid (43), spruce mite (43), pear leaf blister mite (39), green apple aphid (36), birch leaf miner (34), rhododendron lace bug (32), pear psylla (24), pear slug (24), Oriental peach moth (23), apple and thorn skeletonizer (22), pine bark aphid (21), *Gillettea cooleyi* (18), white pine weevil (17), San José scale (16), juniper webworm (16), and fall webworm (15).

Of the plant diseases found in nurseries, leaf blotch on rose headed the list (77). Others in order of number of nurseries found infested were as follows: rust on apple (72), black rot on apple (49), apple scab (44), poplar canker (39), mildew on rose (35), mildew on *Catalpa* (33), mildew on grape (32), mildew on apple (31), leaf spot on *Catalpa* (30), anthracnose on currant (24), leaf spot on strawberry (24), raspberry mosaic (21), rust on juniper (17), leaf spot on phlox (15), mildew on lilac (13), rust on cedar (12), and white pine blister rust on *Ribes* (9).

On account of the abundant rainfall certain fungous diseases like mildews were apparently more abundant than usual.

In order to show the prevalence of certain nursery pests in 1927 as compared with 1926 and the preceding seasons, the record of them for the past seven years is given in the following table:

SEVEN-YEAR RECORD OF CERTAIN NURSERY PESTS

	1921	1922	1923	1924	1925	1926	1927
Oyster-shell scale	36	44	42	44	38	39	45
San José scale	28	19	20	32	32	19	16
Spruce gall aphids*	31	21	28	40	27	42	82
White pine weevil	1	19	17	5	5	8	17
Apple and thorn skeletonizer		1	18	2	8	9	22
Poplar canker	21	31	34	25	34	32	39
Pine blister rust (on *Ribes*)	2	9	6	8	7	9	9
Nurseries uninfested	36	36	32	33	34	46	37

*Includes both *Adelges abietis* and *Gillettea cooleyi*.

It should be understood that the figures in the preceding table are not strictly comparable because of the greater number of nurseries since the new law went into effect in 1925. Thus though the number of infested nurseries is greater, the actual percentage may be considerably less.

NUMBER AND SIZE OF NURSERIES

The number of nurseries in Connecticut has increased each year. The list for 1926 contained 162 names. The list for 1927 contains 191 names. Of the 191 separate nurseries in the State, a classification on account of size may be made as follows:

Nurseries containing 50 acres or more	15
" " between 10 and 50 acres	19
" " " 5 and 10 "	27
" " " 2 and 5 "	52
" " 1 acre or less	78
	191

During the year 1927, 208 nursery inspections were made. The list of nursery firms on the following pages contains 191 names; 15 were inspected twice, once in the spring and again in the fall, and two other nurseries which were inspected failed to qualify in order to receive certificates. Thus 206 regular certificates have been issued, and 206 duplicate certificates have been furnished for filing in other states.

The owners of two small nurseries failed to register before July 1, so, according to Section 2, Chapter 265, Public Acts of 1925, each was charged five dollars as the estimated cost of inspection. This would have been more had it been necessary to make a special trip to inspect each nursery. The total amount of ten dollars ($10.00) was sent to the State Treasurer on March 31.

The total area of Connecticut nurseries is about 2,654 acres. The figures were taken from the owners' estimates on the registration cards, except in cases where the acreage was not given on the cards it was estimated by the inspector. All nurseries of less

than an acre are listed as one acre, and where fractions are given, the next whole number is recorded. This list of nursery firms for 1927 is as follows:

NURSERY FIRMS IN CONNECTICUT RECEIVING CERTIFICATES IN 1927

Name of Firm	Address	Acreage	Certificate Issued	No. of Certificate
Alius, Adolf	Stamford	1	Aug. 19	386
Allen, Henry L.	North Stonington	1	Aug. 29	413
Amelunxen & De Wyn	Yalesville	3	Aug. 16	370
Babski, J. S.	Southington	2	Apr. 9	337
Barnes Bros. Nursery Co.	Yalesville, No. Haven and Durham	150	Aug. 11	352
Barnes Eastern Nurseries	Wallingford	15	Aug. 16	366
Barnes Nursery & Orchard Co.	Wallingford	50	Oct. 17	503
Barton, Robert	Hamden	1	Sept. 10	468
Benbow, A.	Norfolk	1	Sept. 22	489
Berkshire Nurseries (C. B. Myers, Mgr.)	Milford	1	Sept. 10	470
Bertana, Louis	Glenbrook	1	Aug. 19	387
Bertolf Bros.	Greenwich	45	July 22	345
Birchell, George A. (2)	Stonington	1	Aug. 29	414
Booy, H. W.	Yalesville	3	Aug. 16	369
Botsford, R. C.	East Haven	1	Sept. 9	448
Brainard Nursery & Seed Co.	Thompsonville	10	Aug. 26	410
Braley & Co., S. A.	Burnside	3	Aug. 16	367
Branford Nurseries	Branford	4	Aug. 31	429
Bretschneider, A.	Danielson	1	Aug. 30	420
Bridgeport Hydraulic Co.	Bridgeport	200	Nov. 2	510
Bristol Nurseries, Inc.	Bristol	50	Aug. 19	383
Brooklawn Conservatories	Bridgeport	1	Nov. 16	513
Brouwer's Nurseries	New London	2	Aug. 22	400
Brown, E. M.	Hartford	1	Sept. 7	441
Buckley, Walter E.	Groton	1	Aug. 29	417
Bulpitt, Henry F.	Darien	5	Aug. 19	385
Burke, P. J.	Rockville	1	Aug. 16	368
Burr, Morris L.	Westport	1	Aug. 15	363
Burr & Co., C. R.	Manchester, Ellington, and Durham	320	Aug. 5	347
Burroughs, Thomas E.	Deep River	4	Aug. 13	355
Burwell, E. E.	New Haven	1	Sept. 9	450
Cant, Alexander	Springdale	1	Sept. 7	439
Cardarelli, E. J.	Cromwell	2	Aug. 31	428
Carolla, John (2)	Hamden	1	Nov. 23	520
Case, Louis L.	Simsbury	1	Sept. 9	451
Chapman, Anna L.	North Stonington	1	Sept. 7	445
Chapman, C. B.	Groton	1	Aug. 22	399
Chippendale Nurseries (2)	Old Lyme	1	Aug. 22	402
Clark, Raymond H.	Milford	1	Sept. 10	467
Clinton Nurseries (Warren W. Richards, Prop).	Clinton	6	Nov. 29	523
Clyne, George A. (2)	Middlebury and Woodbury	20	Oct. 19	507
Conine Nursery Co.	Stratford	50	Aug. 8	350
Conn. Agricultural College (Prof. S. P. Hollister)	Storrs	1	Sept. 20	484

Name of Firm	Address	Acreage	Certificate Issued	No. of Certificate
Conn. Agr. Expt. Station (W. O. Filley, Forester) ...	New Haven, Hamden, Cheshire and Norwich.....	5	Sept. 10	466
Conn. Valley Nurseries.....	Manchester.....	2	Aug. 8	351
Cooper's (Stratford Florist Co.)....	Stratford.....	1	Dec. 6	527
Corrigan, James J.....	West Haven.....	1	Sept. 7	446
Cragholme Nursery (2).....	Greenwich.....	6	Aug. 25	408
Cronie, G. A.....	New Haven.....	2	Oct. 17	504
Dallas, Inc., Alexander.....	Waterbury.....	3	Nov. 19	518
Dawson, William A.....	Willimantic.....	1	Sept. 19	482
Dowd, Inc., F. C.	Madison.....	2	Dec. 30	533
Dunlap, Daniel S.....	Cromwell.....	3	Aug. 15	362
Eager, Edward M.....	Bridgeport.....	1	Sept. 27	493
East Rock Nursery Co (S. Palmieri, Prop.).....	New Haven.....	1	Sept. 30	497
Eells & Sons.....	Manchester.....	1	Aug. 22	397
Elfgren, I. P. & Sons.....	East Killingly.....	1	Aug. 22	395
Elm City Nursery Co. (Woodmont Nurseries, Inc.)	Woodmont, Milford and Orange.....	120	Sept. 8	447
Elm Grove Cemetery Association.....	Mystic.....	1	Sept. 13	473
Ensign Bickford Co., (S. W. Eddy, Supt.).....	Avon.....	10	Oct. 26	508
Evergreen Nursery Co.....	Wilton.....	15	Aug. 18	381
Fairty, C. H. (2).....	New Canaan.....	2	Nov. 23	522
Farmington Valley Nursery (Harry D. Wilcox, Prop.)..	Avon	2	Sept. 27	494
Flower City Rose Co.....	Manchester.....	1	Aug. 20	390
Fraser's Nurseries & Dahlia Gardens	Willimantic.....	2	Sept. 29	495
Galligan, C. W.....	North Haven.....	2	Sept. 16	480
Gardner, R. H.....	Rocky Hill.	60	Aug. 15	358
Geduldig's Greenhouses.....	Norwich and Ledyard	3	Sept. 10	460
Giuliano, John S.	Wethersfield	1	Sept. 9	454
Glen Terrace Nurseries (Jas. H. Everett, Prop.)...	Mt. Carmel.....	24	Dec. 5	526
Golden Hill Nurseries (Andrew Johnson, Prop.)..	Shelton.....	2	Sept. 21	488
Goodwin Nurseries (2).....	Bloomfield.....	7	Sept. 7	440
Hansen, Peter.....	Fairfield.....	2	Aug. 30	419
Hawes, F. M.....	West Hartford.....	1	Sept. 15	477
Hearn, Thomas H.....	Washington.....	2	Sept. 21	486
Heath & Co.....	Manchester.....	2	Aug. 5	349
Hill Top Nursery (F. W. Langstroth, Prop.).	Danbury.....	4	Aug. 30	425
Hilliard, H. J.....	Sound View.....	1	Sept. 9	455
Hiti Nurseries (J. H. Bowditch, Prop.) ...	Pomfret Center.....	8	Aug. 16	365
Holcomb, Irving.....	Granby.....	1	Aug. 18	380
Holdridge, S. E.....	Ledyard.....	4	Aug. 12	354
Horan & Son, James.....	Bridgeport.....	1	Nov. 10	511
Houston, Byron D.....	Mansfield.....	15	Oct. 28	509
Hoyt's Sons Co., Inc., Stephen	New Canaan.....	500	Aug. 17	377
Hull, Curtis M.....	Wallingford.....	1	Aug. 16	375
Hunt & Co., W. W.....	Hartford.....	8	Aug. 31	427

Name of Firm	Address	Acreage	Certificate Issued	No. of Certificate
Huntoon, Gerald W.	Rocky Hill	1	Aug. 22	405
Intravaia, Joseph	Middletown	2	Aug. 19	384
Jennings, G. S.	Southport	1	Aug. 15	364
Johnson, Tom (2)	Stratford	1	Aug. 30	423
Jones, William	Norwalk	1	Aug. 29	411
Judd, T. H. (2)	Danbury	1	Dec. 31	534
Kauser, Alice (2)	Norwalk	1	Aug. 17	379
Kelley & Son, James J.	New Canaan and Darien	6	Nov. 17	516
Kerner, Eugene	Woodbury	8	Dec. 21	529
Keystone Nurseries (H. H. Kellner, Prop.)	Danbury	1	Sept. 12	471
Leghorn, John	Cromwell	7	Aug. 18	361
Lewis & Valentine, Inc.	Darien	11	Sept. 10	463
Liljenstein, Carl (2)	New London	1	Aug. 22	401
Lundberg, E. A. (2)	Springdale	1	Aug. 22	404
Lynch, Mrs. John H.	Ridgefield	8	Dec. 28	532
Malavasi, Sam	Woodbridge	3	Sept. 9	457
Mallett Co., George A.	Bridgeport	8	Sept. 7	443
Maplewood Nursery Co. (T. H. Peabody, Mgr.)	Norwich	2	Nov. 21	519
Marigold Farm (Henry Kelley, Prop.)	New Canaan	10	Sept. 20	483
Marshall, Robert	Wethersfield	1	Sept. 10	461
Mayapple Nurseries (Paul M. Barrows, Prop.)(2)	Stamford	1	Sept. 10	462
Maynard & Gadbois (2)	Old Lyme	1	Sept. 7	442
McConville, John	Manchester	1	Aug. 22	396
Meier, A. R. (2)	West Hartford	1	Nov. 23	521
Merwin Lane Nursery (J. W. Marvin, Jr., Prop.)	Fairfield	8	Aug. 23	406
Middeleer, Inc.	Darien	10	Sept. 7	444
Millane Nurseries	Cromwell	8	Sept. 9	456
Minge, G. H.	Rocky Hill	1	Aug. 26	409
Moraio Bros.	Stamford	2	Nov. 16	514
Morgan, W. F. (Westerly, R. I.)	North Stonington	3	Aug. 29	416
Moulthrop, William	Watertown	3	Sept. 10	464
Mount Airy Gardens (R. L. Wilson, Prop.) (2)	North Stamford	1	Aug. 22	403
Mount Carmel Nursery	Mount Carmel	1	Dec. 24	531
New Britain Board of Water Commissioners	New Britain and Southington	50	Sept. 15	478
New Haven Nurseries (Louis A. Soldan, Mgr.)	New Haven	1	Nov. 30	524
New Haven Park Commission (G. X. Amrhyn, Supt.)	New Haven	20	Oct. 5	487
New London Cemetery Association	New London	1	Aug. 29	412
New York, New Haven & Hartford Railroad Co. (C. A. Haggerty)	Stamford	6	Dec. 6	528
Nicolson & Thurston	Litchfield	1	Sept. 2	433
North-Eastern Forestry Co.	Cheshire	56	Aug. 4	346
Norwood Nursery	Hamden	1	Aug. 30	421
Oakland Nurseries	Manchester	2	Aug. 5	348

Name of Firm	Address	Acreage	Certificate Issued	No. of Certificate
Old Orchard Nursery (R. G. Hanford, Prop.)	Norwalk	2	Sept. 20	485
Ostergren, Herbert	Cromwell	2	Aug. 16	373
Outpost Nurseries	Ridgefield	75	Aug. 13	356
Ouwerkerk, D. K.	Yalesville	6	Aug. 16	371
Park Gardens	Bridgeport	1	Nov. 17	517
Pedersen, Anthon	Stamford	1	Sept. 17	481
Pequod Nursery Co.	Yalesville	15	Aug. 11	353
Phelps & V. T. Hammer Co. The J. W.	Branford	2	Dec. 24	530
Pierson, Inc., A. N.	Cromwell	110	Aug. 15	357
Polish Orphanage Farm	New Britain	1	Sept. 26	492
Pomeroy, Edwin C.	New Milford	5	Sept. 2	432
Prospect Nurseries, Inc. (S. C. Hubbard, Prop.)	Cromwell	5	Aug. 15	360
Prudence Seymour Gardens (Mary T. Parfitt, Prop.)	New Milford	1	Sept. 2	435
Reynolds, Stephen	South Norwalk	2	Aug. 22	393
Richmond Gordon L.	New Milford	1	Sept. 9	449
Ridgefield Florist & Nursery Co. (W. Pinchbeck, Prop.)	Ridgefield	3	Sept. 6	437
Rockfall Nursery Co., (Philip Marotta, Mgr.)	Rockfall	75	Sept. 3	436
Rottenberg, Julius	Newington Junction	1	Sept. 13	475
Rushworth, Edwin	Yalesville	1	Aug. 16	372
Russell, C. B.	Newington	1	Nov. 12	512
Sage, Hollister	Woodbury	1	Sept. 9	458
Sargeant, A. R.	Tolland	2	Aug. 15	359
Saxe & Floto	Waterbury	1	Sept. 9	459
Schaeffer Bros.	Ledyard	4	Aug. 22	398
Scheepers, Inc., John	Stamford	14	Aug. 22	392
Schoonman, W. J.	New London	5	Oct. 5	499
Schulze, Charles T.	Bethel	1	Sept. 2	431
Scott's Nurseries	Bloomfield	5	Dec. 2	525
Shelton, P. S.	Fairfield	2	Aug. 30	426
Sierman, C. H.	Hartford	8	Sept. 13	474
Simonson, H. C.	Plainville	2	Sept. 10	465
Snelgrove, S. J.	Windsor	2	Aug. 22	394
South Wilton Nurseries (J. C. Van Heiningen, Prop.)	South Wilton	3	Aug. 20	389
Southport Nursery (Coari & Sons, Props.)	Southport	20	Aug. 22	391
Spring Nurseries (Wallace Barnes Co.)	Bristol	2	Sept. 9	452
State of Connecticut (A. F. Hawes, State Forester)	Simsbury	4	Sept. 9	453
State Street Nursery (John Natyzon, Prop.)	New Haven	2	Sept. 22	490
Steck, Charles A.	Newtown	6	Nov. 17	515
Steck, Charles A. Jr.	Bethel	5	Aug. 25	407
Stratfield Nurseries (George R. Godfrey, Prop.)	Bridgeport	20	Oct. 11	501
Stratford Rose Nursery (John Barrow, Prop.)	Stratford	1	Aug. 30	422
Sunridge Nurseries	Greenwich	7	Oct. 18	506
Szirbik & Co., George	New Haven	1	Sept. 12	472
Tanner's Nursery Co.	Manchester	2	Sept. 1	430

Name of Firm	Address	Acreage	Certificate Issued	No. of Certificate
Thomas Nursery	Hamden	1	Sept. 6	438
Upson, R. E.	Marion	3	Sept. 24	491
Vanderbrook & Son, Charles L.	Manchester	18	Aug. 17	376
Van Wilgen Nurseries	Branford	7	Oct. 7	500
Vasileff, Nicholas	Greenwich	3	Oct. 17	502
Verkade's Nurseries	New London	15	Aug. 29	418
Vidal-Mackintosh, Inc.	Stamford	1	Sept. 30	498
Wallace, A. T.	Wallingford	8	Aug. 16	374
Wayside Farm Gardens (Miss I. E. Aldrich, Prop.).	Thomaston	2	Sept. 2	434
Wegner, C. F.	Noroton Heights	2	Sept. 13	476
Wheeler, C. B.	North Stonington	1	Aug. 29	415
Wild's Nursery, Henry	Greenwich and Norwalk	27	Aug. 18	382
Williams & Holmes	Huntington	1	Aug. 30	424
Wilson & Co., C. E.	Manchester	80	Aug. 20	388
Woodruff, C. V.	Orange	1	Sept. 10	469
Wyllie, David	Whitneyville	1	Sept. 29	496
Yale Landscape Department.	New Haven	4	Oct. 17	505
Yale School of Forestry	New Haven	2	Sept. 16	479
Zack & Co., H. J.	Deep River	6	Aug. 17	378
Total 191 nurseries		2654 acres		

Bulletin No. 292, "Some Insects Infesting Nursery Stock in Connecticut," has recently been published and sent to all nurserymen receiving certificates in 1927. This bulletin contains brief descriptions and illustrations of the more common insect pests of nursery stock in Connecticut.

Inspection of Raspberry Plantations

Certain nurserymen and raspberry growers applied for special inspections and certificates in order to enable them to sell plants free from mosaic. Such inspections and certificates are required if raspberry plants are to be shipped into the states of Michigan, Minnesota, New York, and Vermont. Two nursery firms made application for the special inspection and certificates for their raspberry plants, and the inspections were duly made. Certain varieties contained too much mosaic and could not be included, but the following certificates were granted:

Special Certificates on Raspberry Plants

Name of Firm	Address	Variety	Certificate Date of Issue	Certificate Number
Barnes Nursery & Orchard Co	Wallingford	Cuthbert Erskine Park Latham	Oct. 24	16
Conine Nursery Co.	Stratford	La France St. Regis	Oct. 24	15

Nursery Dealers

Chapter 265, Public Acts of 1925, provides that dealers in nursery stock must register each year, on or before March 1, with the State Entomologist, and cite the principal sources of their nursery stock. All dealers' permits are for the remainder of the calendar year and expire on December 31. During the year 80 such dealers have registered and received permits. The list of dealers is on file in the office of the State Entomologist but is not printed in this Report.

Out-of-State Nurserymen

Nurserymen in other states wishing to ship stock into Connecticut are required to file with the State Entomologist signed copies of their nursery inspection certificates and make application for permits to ship stock into the State. These permits are valid only for the periods covered by the certificates placed on file. During the year 213 permits have been issued to nurserymen in other states, but the list of firms receiving them is not printed in this Report.

Parcel Certificates

In addition to the regular inspection and certification of nursery stock, occasionally individuals wish to send shrubs and plants to their friends, and sometimes nurserymen need to ship packages before receiving their regular certificates. Consequently 190 separate parcels of nursery stock have been inspected and package certificates furnished.

Inspection of Narcissus Bulbs

On account of Federal quarantine No. 62, narcissus bulbs grown in Connecticut cannot be shipped into other states unless given two inspections, one in the field in May, and the other after the bulbs have been dug for shipment. In case they are found to be infested with bulb flies or eelworms, they must then be treated. During the year 20,000 such bulbs were inspected and certified.

Inspection of Laurel and Decorative Materials

Considerable decorative material is gathered each year in Connecticut woodlands and shipped into New York City. This is mostly mountain laurel, *Kalmia latifolia*. If gathered within the gipsy moth quarantined area, it is examined by Federal inspectors, and if found clean, is certified for shipment. Much of it is collected outside the quarantined area and yet cannot enter New York without being certified. During the year 230 such certificates were issued.

Inspection of Shelled Seed Corn

On account of the European corn borer having been found in a small portion of Connecticut, certain states would not allow shelled sweet corn for seed to enter unless it had been inspected and certified to be free from bits of cob large enough to carry borers. Therefore a large quantity of such seed corn was inspected as it came through the cleaning mill, and 259 certificate tags were issued.

INSPECTION OF IMPORTED NURSERY STOCK

W. E. Britton and M. P. Zappe

For the past eight years the only nursery stock allowed to enter Connecticut from foreign countries has been entirely rose and fruit tree seedlings for propagation. This material is released at ports of entry; notice of its arrival is sent to this office, and it is inspected at its destination. All other plant material must go to Washington, where it is inspected, and if necessary, fumigated or destroyed. The imported nursery stock entering Connecticut in 1927 was inspected by Mr. Zappe, assisted at rush times by Messrs. B. H. Walden, B. W. McFarland, and J. P. Johnson. The number of shipments, cases, and plants was slightly less than in 1926, but the number of plants has been exceeded only in 1924 and 1926, as the following table shows:

Year	No. of shipments	No. of cases	No. of plants
1920	17	87	814,491
1921	21	126	1,228,560
1922	30	159	1,997,595
1923	35	179	1,981,895
1924	33	313	3,489,170
1925	27	277	2,977,346
1926	32	347	3,443,357
1927	31	321	3,229,915

Though the greatest number of shipments came from Holland, the greatest number of cases and plants came from France, as the following table indicates:

Sources of Imported Nursery Stock, 1926-1927

Country	No. of shipments	No. of cases	No. of plants
France	10	169	2,090,900
Holland	14	141	1,048,515
England	7	11	90,500
	31	321	3,229,915

These 31 shipments were imported by 11 different Connecticut firms, 18 shipments being consigned to two firms. Of the total number of shipments, 20 shipments contained only rose stocks,

6 shipments contained only fruit stocks, and 5 shipments contained both rose and fruit stocks.

Of this plant material inspected, 1,635,915, or about 51 per cent, were rose stocks, and 1,594,000, or about 49 per cent, were fruit seedlings. The number of each variety is shown in the following table:

KINDS OF STOCK IMPORTED

Variety	Number of Plants	Total
FRUIT STOCKS		
Apple (all kinds)	517,000	
Cherry (all kinds)	689,500	
Hazel (*Corylus avellana*)	2,000	
Pear	103,000	
Plum	232,500	
Quince	50,000	1,594,000
ROSE STOCKS		
Rosa manetti	1,206,015	
Rosa multiflora japonica	308,900	
Rosa rugosa	121,000	1,635,915
Total		3,229,915

The following table shows the quantities of stock inspected, by months:

Month	No. of shipments	No. of cases	No. of plants
December	5	12	79,500
January	19	277	2,831,915
February	4	26	218,500
March	3	6	100,000
	31	321	3,229,915

The time required to inspect this stock is equivalent to one man working 47 days, and this time, together with the cost of travel and other necessary expenses, amounts to about $500.

In addition to the material enumerated and tabulated on the foregoing pages there were 27 shipments of tree seeds which were not inspected in Connecticut. Regarding all shipments of imported stock, 51 reports were made to the Federal Horticultural Board.

Of the 31 shipments inspected, 22 shipments, or about 70 per cent, were found infested with insects or plant diseases, some of which are well-known pests. Details regarding these infestations are given below.

PESTS FOUND ON IMPORTED NURSERY STOCK

22 Shipments Infested

INSECTS

Acronycta rumicis Linn., on cherry (1 shipment). Andre Choplin, Maze. France.

Agrilus viridis var. *fagi* Ratz., work of, on Manetti (1 shipment). Felix & Dykhuis, Holland.

Aporia crataegi Linn., nests on appie (1 shipment). Andre Chopin, Maze, France.
Calophasia lunula Hubn. (3 shipments) on quince. A. Fermaud, Angers, France. On apple, pear and plum, Andre Choplin, Maze, France.
Emphytus cinctus Linn. (14 shipments). A Fermaud, Angers, France; Hemeray Aubert, Orleans, France; Oudyk Bros. Nurseries, Boskoop, Holland; C. Klijn & Co., Boskoop, Holland; Chas. Walter Slocock, Woking, Surrey, England; Fa. As. Ouwerkerk, Boskoop, Holland; P. Ouwerkerk, Boskoop, Holland; Louis Leroy's Nursery, Angers, France.
Euproctis chrysorrhoea Linn., on apple (1 shipment) winter nest. Andre Choplin, Maze, France.
Hymenopterous pupae (1 shipment). A. Fermaud, Angers, France.
Lepidopterous pupae, unidentified (7 shipments). Louis Sebire & Sons, Ussy, Calvados, France; butterfly, Andre Choplin, Maze, France; Louis Leroy, Angers, France; A. Fermaud, Angers, France.
Lymantid larva on apple (1 shipment). Andre Choplin, Maze, France.
Noctuid moth on pear (1 shipment). A. Fermaud, Angers, France.
Notolophus antiqua Linn. on apple (1 shipment). Louis Sebire & Sons, Ussy, Calvados, France.
Papilio podalirius Linn. (2 shipments) cocoons on apple and cherry. Andre Choplin, Maze, France.
Sitona sp. weevil in spider's web (1 shipment). A. Fermaud, Angers, France.
Spider's eggs (3 shipments) on cherry. Andre Choplin, Maze, France; on quince, Louis Leroy's Nursery, Angers, France.
Vanessa sp. on rose (1 shipment). A. Fermaud, Angers, France.
Woolly aphid on apple (2 shipments). Louis Sebire & Sons, Ussy, Calvados, France; on rose, Oudyk Bros., Boskoop, Holland.

Plant Diseases

Crown gall on rose (2 shipments). Walter C. Slocock, Woking, Surrey, England; R. H. Bath, Ltd., Wisbeck, England.

INSPECTION OF APIARIES IN 1927

In 1927, as for several years past, the apiaries have been inspected by Messrs. H. W. Coley of Westport and A. W. Yates of Hartford, on a *per diem* basis. Mr. Coley covers the southern half of the State (Fairfield, New Haven, Middlesex, and New London Counties), and Mr. Yates the northern half (Litchfield, Hartford, Tolland, and Windham Counties).

This work in 1927 required 136 man days and with traveling expenses cost $1,905. In all, 803 apiaries, containing 8,133 colonies, were inspected in 1927, as against 814 apiaries, containing 7,923 colonies, in 1926. The apiaries averaged 10.1 colonies each in 1927, and 9.7 each in 1926.

The following table shows the number of apiaries and colonies inspected and the average number of colonies per apiary, as well as the cost per apiary and colony for each year since the inspection work was commenced in 1910:

EIGHTEEN-YEAR RECORD OF APIARY INSPECTION IN CONNECTICUT

Year	No. of Apiaries	No. of Colonies	Average No. Colonies Per Apiary	Average Cost of Inspection Per Apiary	Per Colony
1910	208	1,595	7.6	$2.40	.28
1911	162	1,571	9.7	1.99	.21
1912	153	1,431	9.3	1.96	.21
1913	189	1,500	7.9	1.63	.21
1914	463	3,882	8.38	1.62	.19
1915	494	4,241	8.58	1.51	.175
1916	467	3,898	8.34	1.61	.19
1917	473	4,506	9.52	1.58	.166
1918	395	3,047	7.8	1.97	.25
1919	723	6,070	11.2	2.45	.29
1920	762	4,797	6.5	2.565	.41
1921	751	6,972	9.2	2.638	.24
1922	797	8,007	10.04	2.60	.257
1923	725	6,802	9.38	2.55	.27
1924	953	8,929	9.4	2.42	.25
1925	766	8,257	10.7	2.45	.22
1926	814	7,923	9.7	2.35	.24
1927	803	8,133	10.1	2.37	.234

In 1927, apiaries were inspected in 135 towns, as against 137 towns in 1926, and 118 towns in 1925.

Inspections were made in the following 17 towns in 1927, which were not visited in 1926: Fairfield County—Monroe, Shelton, Stratford, and Trumbull; New Haven County—Ansonia, Milford, Oxford, Seymour, West Haven; Middlesex County—Essex; New London County—New London; Litchfield County—Plymouth; Hartford County—Marlborough, Windsor Locks; Tolland County —Hebron; Windham County—Chaplin, Thompson.

On the other hand, the following 19 towns, where inspections were made in 1926, were not visited by the inspectors in 1927: Fairfield County—Norwalk; New Haven County—Branford, East Haven, Meriden, Middlebury, North Branford, Orange; Middlesex County—Killingworth; New London County—East Lyme, Lyme, Old Lyme, Preston, Sprague; Litchfield County—Cornwall, Goshen; Hartford County—Enfield, Southington; Windham County—Pomfret, Sterling.

There are several towns where no recent inspections have been made. In Southbury (New Haven County) the last inspection was made in 1916. In Warren (Litchfield County) no apiaries have been inspected since 1919, though the inspector has made inquiries and failed to learn of any beekeepers in the town. In New Fairfield and Sherman (Fairfield County) the last inspections were made in 1920, and Bethany (New Haven County) and Bridgeport (Fairfield County) have not been inspected since 1922. Inspections have not been made since 1924 in Hamden, New Haven and Wolcott (New Haven County), Weston (Fairfield County), and Eastford (Windham County). In 1925 the last inspections

were made in Cheshire (New Haven County), Saybrook (Middlesex County), and South Windsor (Hartford County).

European Foul Brood

This is a disease of the young larvae, caused by a bacterial germ known as *Bacillus pluton*, and commonly called European foul brood. Usually it is more troublesome in early summer than at other times during the year, the cell contents are not ropy or gelatinous, and though often with the odor of fermentation, it is not very offensive. Requeening with Italian queens and uniting two or more weak colonies to make them strong are common methods of control.

Of the 803 apiaries and 8,133 colonies inspected in 1927, 9 apiaries and 23 colonies were found infested with European foul brood. This infestation amounts to 1.12 per cent of the apiaries and .282 per cent of the whole number of colonies inspected during the season—the lowest percentages ever found in Connecticut since the beginning of the inspection work.

The following table gives a complete record of percentages of infestation of European foul brood in Connecticut since the inspection work began in 1910:

RECORD OF EUROPEAN FOUL BROOD

Year	Percentage of Infestation Apiaries	Colonies	Year	Percentage of Infestation Apiaries	Colonies
1910	75.9	49.7	1919	6.6	1.2
1911	51.8	27.4	1920	4.3	1.5
1912	47.7	23.5	1921	3.91	1.26
1913	44.4	24.5	1922	4.14	.85
1914	32.6	13.9	1923	2.34	.36
1915	26.1	10.3	1924	1.78	.526
1916	18.8	7.05	1925	2.48	.507
1917	16.7	4.86	1926	3.19	.858
1918	9.8	3.3	1927	1.12	.282

During 1927, European foul brood was discovered only in the following seven towns: Plymouth in Litchfield County; Bristol, Farmington, Granby, Plainville, and Windsor Locks in Hartford County; and Stafford in Tolland County. No apiaries infested with this disease were found in Fairfield, New Haven, Middlesex, New London, or Windham Counties.

American Foul Brood

American foul brood is also a disease of the larvae caused by the bacterial organism known to science as *Bacillus larvae*, but it attacks the brood at a later stage of development than does the European foul brood. It usually shows when the larvae are nearly mature or pupating after the cells are sealed. The diseased cells are shrunken, and if broken open, the contents have a peculiar

ropy or stringy consistency and give off a very offensive odor. Formerly the treatment was to shake the bees into clean hives, destroy the infected combs, and disinfect the old hives. Now the diseased combs may be sterilized by soaking them in an alcohol-formalin solution containing twenty per cent of formalin, after which they may be used with safety.

Of the 803 apiaries and 8,133 colonies inspected in 1927, 25 apiaries and 57 colonies were infested with American foul brood. This infestation is equivalent to 3.11 per cent of the apiaries and .7 per cent of the colonies inspected in 1927. This record for 1927 is a greater percentage of infested apiaries than is usually found and was exceeded only in 1925; it is the highest percentage of colonies ever found infested with this disease.

The following table shows a complete record regarding American foul brood since apiary inspection was started in Connecticut in 1910:

RECORD OF AMERICAN FOUL BROOD

Year	Percentage of Infestation Apiaries	Colonies	Year	Percentage of Infestation Apiaries	Colonies
1910	0	0	1919	3	1.1
1911	0	0	1920	1.18	.25
1912	0	0	1921	2.5	.56
1913	0	0	1922	1.38	.27
1914	1.07	.7	1923	.985	.323
1915	.8	.18	1924	1.04	.22
1916	1.07	.15	1925	3.26	.424
1917	.42	.17	1926	1.72	.29
1918	1.01	.32	1927	3.11	.70

During 1927, American foul brood was found in the following 16 towns: Derby, Madison, Naugatuck, Prospect, and Wallingford, in New Haven County; Durham in Middlesex County; Norwich in New London County; Bethlehem, Litchfield, North Canaan, Plymouth, Torrington, Washington, and Winchester, in Litchfield County; Bristol in Hartford County; and Ellington in Tolland County.

Sacbrood

Sacbrood or pickled brood is a disease often mistaken for American or European foul brood. The cause is considered to be a filterable virus. The larvae die about the time the cells are capped and lie on their backs with heads turned upward. The body is swollen and contents watery, but there is no ropiness, and the entire cell contents may easily be removed intact as if enclosed in a sac. The color is variable, though often light yellow or brown, with head nearly black. The usual treatment is to make strong colonies by uniting the weak ones. In certain rare cases where whole apiaries become infected, new queens should be supplied to all the colonies.

The following table shows the record of sacbrood since apiary inspection in Connecticut started in 1910:

RECORD OF SACBROOD

Year	Percentage of Infestation Apiaries	Colonies	Year	Percentage of Infestation Apiaries	Colonies
1910	0	0	1919	1.24	.19
1911	..	.51	1920	1.18	.229
1912	..	Several	1921	1.06	.157
1913	..	2.8	1922	1.37	.187
1914	2.59	.721	1923	.53	.086
1915	2.02	.47	1924	1.78	.52
1916	.428	.051	1925	3.39	.836
1917	1.48	.199	1926	1.1	.138
1918	.253	.032	1927	.03	.0036

During the year, sacbrood was found in the following three towns: Essex and Portland in Middlesex County, and Voluntown in New London County.

Statistics of Inspection

The statistics of apiary inspection by towns and counties may be found in the following pages, with summary on page 230.

INSPECTION OF APIARIES, 1927

Town	Apiaries Inspected	Apiaries Diseased	Colonies Inspected	Colonies Diseased	Foul Brood American	Foul Brood European	Sacbrood
Fairfield County:							
Bethel	4	0	37	0	0	0	0
Brookfield	3	0	68	0	0	0	0
Danbury	12	0	146	0	0	0	0
Darien	1	0	42	0	0	0	0
Easton	3	0	87	0	0	0	0
Fairfield	7	0	93	0	0	0	0
Greenwich	21	0	220	0	0	0	0
Monroe	6	0	89	0	0	0	0
New Canaan	3	0	25	0	0	0	0
Norwalk	2	0	41	0	0	0	0
Redding	3	0	51	0	0	0	0
Ridgefield	5	0	48	0	0	0	0
Shelton	2	0	27	0	0	0	0
Stamford	8	0	161	0	0	0	0
Strafford	1	0	28	0	0	0	0
Trumbull	2	0	32	0	0	0	0
Westport	2	0	18	0	0	0	0
Wilton	9	0	179	0	0	0	0
	94	0	1392	0	0	0	0
New Haven County:							
Ansonia	7	0	41	0	0	0	0
Beacon Falls	2	0	48	0	0	0	0
Derby	3	1	21	1	1	0	0
Guilford	4	0	37	0	0	0	0
Madison	3*	2	18	4	4	0	0
Milford	5	0	48	0	0	0	0

* One apiary inspected three times.

Town	Apiaries Inspected	Apiaries Diseased	Colonies Inspected	Colonies Diseased	Foul Brood American	Foul Brood European	Foul Brood Sacbrood
New Haven County—*Continued*							
Naugatuck	6	2	64	2	2	0	0
North Haven	2	0	31	0	0	0	0
Oxford	2	0	38	0	0	0	0
Prospect	5	1	39	4	4	0	0
Seymour	3	0	13	0	0	0	0
Wallingford	17**	4	107	7	7	0	0
Waterbury	6	0	42	0	0	0	0
West Haven	1	0	8	0	0	0	0
	66	10	555	18	18	0	0

** Two apiaries inspected twice.

Middlesex County:							
Chester	5	0	45	0	0	0	0
Clinton	4	0	59	0	0	0	0
Cromwell	6	0	59	0	0	0	0
Durham	7	1	163	1	1	0	0
East Haddam	5	0	178	0	0	0	0
East Hampton	13	0	218	0	0	0	0
Essex	5	1	50	1	0	0	1
Haddam	5	0	58	0	0	0	0
Middlefield	2	0	53	0	0	0	0
Middletown	5	0	77	0	0	0	0
Old Saybrook	5	0	74	0	0	0	0
Portland	6	1	61	1	0	0	1
Westbrook	1	0	8	0	0	0	0
	69	3	1103	3	1	0	2
New London County:							
Bozrah	1	0	15	0	0	0	0
Colchester	6	0	54	0	0	0	0
Franklin	2	0	77	0	0	0	0
Griswold	3	0	94	0	0	0	0
Groton	1	0	32	0	0	0	0
Lebanon	6	0	116	0	0	0	0
Ledyard	3	0	40	0	0	0	0
Lisbon	2	0	28	0	0	0	0
Montville	6	0	60	0	0	0	0
New London	3	0	15	0	0	0	0
No. Stonington	3	0	35	0	0	0	0
Norwich	10	2	248	6	6	0	0
Salem	1	0	8	0	0	0	0
Stonington	9	0	68	0	0	0	0
Voluntown	4	1	31	1	0	0	1
Waterford	3	0	52	0	0	0	0
	63	3	973	7	6	0	1
LitchfieldCounty:							
Barkhamsted	2	0	4	0	0	0	0
Bethlehem	10	2	45	7	7	0	0
Bridgewater	6	0	94	0	0	0	0
Canaan	2	0	4	0	0	0	0
Colebrook	2	0	28	0	0	0	0
Harwinton	7	0	22	0	0	0	0
Kent	4	0	85	0	0	0	0
Litchfield	4	1	55	1	1	0	0

Town	Apiaries Inspected	Apiaries Diseased	Colonies Inspected	Colonies Diseased	Foul Brood American	Foul Brood European	Sacbrood
Litchfield County—*Continued*							
Morris	4	0	24	0	0	0	0
New Hartford	4	0	11	0	0	0	0
New Milford	6	0	46	0	0	0	0
Norfolk	5	0	25	0	0	0	0
North Canaan	8	1	79	1	1	0	0
Plymouth	9*	5	53	13	4	9	0
Roxbury	4	0	29	0	0	0	0
Salisbury	8	0	64	0	0	0	0
Sharon	4	0	118	0	0	0	0
Thomaston	11	0	60	0	0	0	0
Torrington	9	1	78	2	2	0	0
Washington	6	1	122	5	5	0	0
Watertown	9	0	56	0	0	0	0
Winchester	12	1	66	3	3	0	0
Woodbury	3	0	69	0	0	0	0
	139	12	1237	32	23	9	0

*1 colony inspected twice.

Hartford County:							
Avon	3	0	22	0	0	0	0
Berlin	12	0	159	0	0	0	0
Bloomfield	5	0	147	0	0	0	0
Bristol	13	2	62	5	1	4	0
Burlington	6	0	20	0	0	0	0
Canton	6	0	34	0	0	0	0
East Granby	2	0	20	0	0	0	0
East Hartford	3	0	29	0	0	0	0
East Windsor	13	0	58	0	0	0	0
Farmington	13	1	59	3	0	3	0
Glastonbury	14	0	151	0	0	0	0
Granby	10	1	78	3	0	3	0
Hartford	4	0	11	0	0	0	0
Hartland	1	0	60	0	0	0	0
Manchester	7	0	67	0	0	0	0
Marlborough	2	0	35	0	0	0	0
New Britain	11	1*	90	1*	0	0	0
Newington	7	0	53	0	0	0	0
Plainville	8	1	29	1	0	1	0
Rocky Hill	3	0	33	0	0	0	0
Simsbury	10	0	75	0	0	0	0
Suffield	10	0	86	0	0	0	0
West Hartford	8	0	77	0	0	0	0
Wethersfield	10	0	49	0	0	0	0
Windsor	11	0	84	0	0	0	0
Windsor Locks	6	1	24	1	0	1	0
	198	7	1612	14	1	12	0

*Bee paralysis

Tolland County:							
Andover	3	0	21	0	0	0	0
Bolton	3	0	14	0	0	0	0
Columbia	5	0	14	0	0	0	0
Coventry	13	0	126	0	0	0	0
Ellington	14	2	75	8	8	0	0
Hebron	5	0	23	0	0	0	0
Mansfield	16	0	79	0	0	0	0

Town	Apiaries Inspected	Apiaries Diseased	Colonies Inspected	Colonies Diseased	Foul Brood American	Foul Brood European	Foul Brood Sacbrood
Tolland County—*Continued*							
Somers	1	0	1	0	0	0	0
Stafford	8	1	28	2	0	2	0
Tolland	6	0	42	0	0	0	0
Union	1	0	5	0	0	0	0
Vernon	7	0	49	0	0	0	0
Willington	8	0	34	0	0	0	0
	90	3	511	10	8	2	0
Windham County:							
Ashford	3	0	38	0	0	0	0
Brooklyn	4	0	167	0	0	0	0
Canterbury	4	0	27	0	0	0	0
Chaplin	3	0	28	0	0	0	0
Hampton	11	0	94	0	0	0	0
Killingly	16	0	76	0	0	0	0
Plainfield	18	0	80	0	0	0	0
Putnam	4	0	26	0	0	0	0
Scotland	4	0	36	0	0	0	0
Thompson	7	0	58	0	0	0	0
Windham	7	0	80	0	0	0	0
Woodstock	3	0	40	0	0	0	0
	84	0	750	0	0	0	0

SUMMARY

County	No. Towns	Apiaries Inspected	Apiaries Diseased	Colonies Inspected	Colonies Diseased	Foul Brood American	Foul Brood European	Foul Brood Sacbrood
Fairfield	18	94	0	1,392	0	0	0	0
New Haven	14	66	10	555	18	18	0	0
Middlesex	13	69	3	1,103	3	1	0	2
New London	16	63	3	973	7	6	0	1
Litchfield	23	139	12	1,237	32	23	9	0
Hartford	26	198	7*	1,612	14*	1	12	0
Tolland	13	90	3	511	10	8	2	0
Windham	12	84	0	750	0	0	0	0
	135	803	38	8133	84	57	23	3

*1 colony had bee paralysis.

	No. Apiaries	No. Colonies
Inspected	803	8133
Infested with European foul brood	9	23
Per cent infested	1.12	.282
Infested with American foul brood	25	57
Per cent infested	3.113	.7
Infested with sacbrood	3	3
Infested with bee paralysis	1	1
Average number of colonies per apiary		10.1
Cost of inspection		$1905.
Average cost per apiary		2.37
Average cost per colony		.234

GIPSY MOTH WORK IN CONNECTICUT, 1927

JOHN T. ASHWORTH AND W. E. BRITTON

This work is conducted in close co-operation with the Federal Bureau of Entomology, and all State and Federal men in charge of the work realize that more and better results can be obtained in this manner. We wish here to express our thanks and appreciation to Messrs. A. F. Burgess, C. W. Collins, and H. L. Blaisdell of the Federal Bureau for their assistance and co-operation.

In the following report of the work done in the separate towns, no mention has been made of the areas sprayed, but by turning to the table of statistics one can easily estimate the amount of spraying done, as seventy-five pounds of arsenate of lead will spray about one acre of the average woodland.

FINANCIAL STATEMENT

RECEIPTS

Appropriation for biennial period ending June 30, 1927	$100,000.00	
Expended July 1, 1925 to June 30, 1926	53,125.56	
Balance available July 1, 1926		46,874.44
Additional appropriation, General Assembly of 1927		10,000.00
Total		$56,874.44

EXPENDITURES

Salaries	4,747.50	
Labor	42,018.06	
Stationery and office supplies	56.40	
Sundry supplies	3.85	
Communication service		
Telegraph .35		
Telephone 95.65		
Postage 2.63	98.63	
Travel expenses 512.29; Gasoline 2,566.19	3,078.48	
Transportation of things; express	2.76	
Publications; Printing legal notices in papers	42.00	
Heat, light, water and power		
Fuel—coal 181.00		
Light—electricity 14.64	195.54	
Live stock poisoned by lead arsenate	245.00	
Tools, machinery and appliances	5,013.02	
Buildings and land		
Office rental 24.00		
Garage rental 626.55	650.55	
Contingent expenses		
Insurance—motor vehicles 682.20		
Medical services 38.00		
Registration 1.00	721.20	
		$56,873.09
Balance		1.35
		$56,874.44

Details of Work by Counties and Towns

The following pages contain a detailed account of the scouting, spraying, and other control measures in the infested towns. All egg-clusters found were treated with creosote to prevent hatching. The statistics are given in the tables beginning on page 241, and are summarized on page 243.

WINDHAM COUNTY

The only scouting done in Windham County this year was in the towns of Brooklyn, Canterbury, Killingly, and Putnam, where both State and Federal men were trained during the fall and early winter, then transferred to other parts of the territory. Federal men scouted in Brooklyn, Killingly, and Putnam, and State men in Canterbury.

Brooklyn—4 Infestations—93 Egg-clusters

The largest colony found in the town was one of 35 egg-clusters on oak trees in the southeastern corner of the town near the Quinebaug River. Another one, of 30 egg-clusters, was on oak and birch growth owned by Mike Caffery, situated in the north-central portion of the town near the Pomfret town line. Two of these colonies were sprayed by State men in June.

Canterbury—18 Infestations—1,565 Egg-clusters

Canterbury was scouted by green men training for State crews, and only the northern half of the town was completed. Three large colonies were found, the largest being in the northeastern corner of the town on land owned by Andrew Clark, where 1,035 egg-clusters occurred on ten trees in a pasture. The next largest was about one mile west of the colony just mentioned, on two apple trees in a pasture, owned by Mrs. Ida Shorter, and containing 115 egg-clusters. The third colony contained 83 egg-clusters and was located about one and one-half miles west of the colony last mentioned, in woodland owned by Mr. Beauchene. Nine places were sprayed in the spring by a State crew.

Killingly—18 Infestations—993 Egg-clusters

Killingly is still generally infested, though only four large colonies were found this year; one, of 300 egg-clusters, was in the northwestern corner of the town in apple and oak trees on land owned by R. Butler; about a mile south of this colony another, of 85 egg-clusters, was found in mixed growth, and there were two other colonies in this same section of the town (known as the "Chestnut Hill section"); one of 75 egg-clusters on oak trees owned by B. A. Larkin, and one of 55 egg-clusters on apple trees

on an adjoining farm owned by Ervin Hill. Thirteen of the 18 colonies were sprayed by State men.

Putnam—17 Infestations—413 Egg-clusters

Three large colonies were found in Putnam this year, and although the town is generally infested, all the infestations discovered were under twenty egg-clusters each, except the three mentioned here. The largest contained 130 egg-clusters in oak trees and stone wall on woodland margin near the town line, on the east side of the State road leading to Mechanicsville. Another colony of 75 egg-clusters was in an orchard owned by Jerome Shippee, in the southwestern part of the town. The third contained 50 egg-clusters on oaks in East Putnam just south of the Four Corners. Fifteen of the seventeen colonies were sprayed in the spring by State men.

NEW LONDON COUNTY

Colchester—3 Infestations—585 Egg-clusters

The old colony on Edwin Brown's property was again found infested, and 496 egg-clusters were creosoted there. Another colony of 77 egg-clusters was found in woodland owned by Levine Himen, and a third colony containing 12 egg-clusters in woodland owned by Steve Fedus. All three infestations were situated in the eastern half of the town. A large amount of spraying was done by State men in this town, where extreme measures were taken to eradicate these colonies. Over a ton of dry arsenate of lead was used and about 45 acres of woodland were sprayed.

Groton—16 Infestations—380 Egg-clusters

Groton was scouted in the late spring, and before the town was completed the men were called in to start spraying. One colony of 87 egg-clusters was found on 14 trees, stone wall and fence situated along the State road leading from Mystic to Groton, just west of Mystic village; another of 70 egg-clusters on land owned by Spicer Coal Company in Groton village; 50 egg-clusters were found on cherry trees, fence, stone wall and shed owned by C. C. Todd, near the Sea Sled plant, and one of 47 egg-clusters was found on 17 trees located on the Sea Sled property. These were the largest colonies found this year in Groton, and 12 of the 16 infestations were sprayed by State men.

Stonington—9 Infestations—5,572 Egg-clusters

In scouting Stonington this year several large colonies were discovered. In Stonington village 1,150 egg-clusters were found on 174 trees scattered all through the village. Another colony of 4,004 egg-clusters was found in oak, hickory, and birch on land

owned by Silas Wheeler and Mrs. Boynton, just north of the village of Old Mystic. The scouting on "Mason's Island" was not completed, as the men had to be called in to start spraying. However, 215 egg-clusters were found in this district up to the time scouting was discontinued. Practically all trees and shrubs in the village of Stonington were sprayed, and on Mason's Island a large proportion of the native tree growth was sprayed. The nine infestations were sprayed by State men.

We wish to take this opportunity to thank the town officials and citizens for their co-operation and help in this fight against the gipsy moth.

TOLLAND COUNTY

Andover

Andover was scouted by State men during March, but no trace of the gipsy moth was found.

Bolton—2 Infestations—168 Egg-clusters

Of the 168 egg-clusters found in Bolton this year, 167 of them were in woodland owned by Mr. Alvord, about one mile southeast of Bolton village; the other infestation was in the section of the town known as "Bolton Notch," where one old egg-cluster was found on a roadside black oak. About nine acres were sprayed at the woodland colony in June by State men.

Columbia—1 Infestation—127 Egg-clusters

The scouting season was nearly over and larvae were feeding before this town could be scouted, so the work was confined to the territory around last year's infestation. A crew was sent to put in one day around this colony, and finding larvae feeding, no scouting was done, but later in the spring, on June 17, State men sprayed about three acres of woodland and one orchard at this colony, which is situated on the State road leading from Columbia to Hebron, on land owned by Mr. Kretsowitz.

HARTFORD COUNTY

Burlington—4 Infestations—146 Egg-clusters

Three small infestations were discovered by a State crew in Burlington, and one large colony containing 134 egg-clusters was found in apple, oak, and maple trees on land owned by Harry Ney, located in the western part of the town near the Harwinton line. The three small infestations were close together in the northwestern corner of the town on land owned by Stephen Shuster and Ernest Ventries. Altogether, 12 egg-clusters were found at the three places. Federal men sprayed about four acres of woodland at two of these infestations.

Canton—4 Infestations—825 Egg-clusters

All four infestations found by State men in Canton this year were in the extreme northern part of the town and were all in woodland. Two of them were very large for this part of the State, the largest being on land owned by W. Fretay; 551 egg-clusters were found and creosoted on 127 trees. At Mr. L. King's place, 170 egg-clusters were treated. The two other colonies were small ones. Federal men sprayed two of these infestations.

East Granby—3 Infestations—142 Egg-clusters

A colony of two egg-clusters was found on willow trees owned by Mr. Viets, just north of East Granby post office; two larger colonies were found in the northwestern part of the town—one of 15 egg-clusters on oak and birch trees at Newgate Prison, and the other in woodland owned jointly by Messrs. Colton, Case and Clark, where 125 egg-clusters were creosoted. At the last two colonies over 30 acres of woodland were sprayed by Federal men.

East Hartford—1 Infestation—10 Egg-clusters

State men scouted East Hartford this year, but only one small colony was found. This was one of 10 egg-clusters, a reinfestation of last year's colony in woodland owned by Mr. H. E. Kenney. About four acres of woodland were sprayed on June 17 by State men.

Farmington—3 Infestations—13 Egg-clusters

The scouting in Farmington this year was confined to the territory in the northeastern part of the town—the only district that has been found infested since 1924. Three small infestations were discovered, all within an area of one square mile. One colony of five egg-clusters was in an orchard owned by Mr. F. H. Andrews, and the other two were in woodland owned by Mr. Frederick Beach, where three and five egg-clusters respectively were found. Five acres of woodland were sprayed by Federal men.

Glastonbury—6 Infestations—394 Egg-clusters

A group of four infestations was discovered in the eastern end of the town, three of them on land owned by John Sarini. One was large, containing 182 egg-clusters; the other three colonies (one on land owned by C. Zold) were all small. The two other colonies were in the western part of the town, one of 17 egg-clusters in South Glastonbury on land owned by J. B. Abendroth, and the other in Glastonbury village, in an orchard owned by A. E. Hollister, where 179 egg-clusters were found. Five of these infestations were sprayed by State men.

Granby—31 Infestations—2,873 Egg-clusters

Several large colonies were found in Granby this year by State men, four of them being the largest found in this part of the State. They were all situated in the southwestern corner of the town. The largest was one of 1,189 egg-clusters found on land owned by Messrs. Bors, Shinder and Luprun. This colony was spread over several acres of pasture and woodland. Another colony of 495 egg-clusters was found in woodland owned by A. Luprun, and one of 257 egg-clusters in woodland belonging to Willis Edgerton. The next largest colony was one of 162 egg-clusters found in woodland of Andrew Bors and A. Luprun. Six of the colonies were sprayed by Federal men.

Hartford—2 Infestations—48 Egg-clusters

Two small colonies were found in Hartford this year; one of 45 egg-clusters on three apple trees owned by Max Case, at 915 Windsor Avenue, and the other, a small colony of three egg-clusters found on two plum trees on property of D. Ahern on Crown Street. The colony on Windsor Avenue was sprayed by Federal men. It was thought unnecessary to spray around the Crown Street infestation.

Hartland—14 Infestations—343 Egg-clusters

The largest colony in the town was the only one found in the western part, and contained 78 egg-clusters in woodland owned by T. A. Howell, in the extreme northwestern corner of the town. The other 13 colonies were along the eastern border: three of them were large enough to mention here. One of 55 egg-clusters was found in woodland owned by Semon Brown, about one mile east of East Hartland post office; another of 47 egg-clusters was in woodland owned by John Liskey, about two miles north of the post office, and the third, of 46 egg-clusters, was in woodland belonging to Lawrence Ransom just west of the post office. Eight of the places were sprayed by Federal men.

New Britain—4 Infestations—106 Egg-clusters

Although the foreman of the crew that scouted New Britain reported four infestations, he might have counted them as two, since three of the colonies were very close together on land owned by the Polish Orphanage and Peter and George Sieving, on or near Osgood Avenue and North Burritt Street. Altogether, 88 egg-clusters were found at these three colonies. The other colony was one of 18 egg-clusters found on five oak and hickory trees in a yard at 49 Bassett Street, owned by William Mangan. Both of the places were sprayed by Federal men.

Simsbury—12 Infestations—747 Egg-clusters

Only one important colony was found in Simsbury; this was on walnut, oak, and pine trees on land where W. W. Sperry is caretaker, a little north of the West Simsbury post office. The other colonies were all small, but since all but one were located in the western half of the town on high ground, windspread might occur under certain conditions and the young larvae might be distributed over a large area of uninfested territory. Four of the places were sprayed by Federal men.

South Windsor—1 Infestation—2 Egg-clusters

In scouting South Windsor this year, State men found only one small colony of two egg-clusters on apple and cherry trees in the yard of Mrs. Louis Sperry, in East Windsor Hill village. Spraying was thought to be unnecessary as the egg-clusters were not broken when they were found and creosoted.

Suffield—7 Infestations—292 Egg-clusters

Of the 292 egg-clusters found in Suffield, 253 were at two places; the other five colonies were small and not dangerous. At one of the large colonies, 167 egg-clusters were on five white oaks in a field owned by Henry Sheldon, about one and one-half miles north of West Suffield four corners; the other colony was one of 86 egg-clusters on the west side of the railroad near the East Granby town line, on land belonging to Frank Hastings and Andrew Barr. Three of the places were sprayed by Federal men.

West Hartford—1 Infestation—14 Egg-clusters

A very peculiar situation was found by State men while scouting West Hartford this year: The only colony was one of 14 old egg-clusters; no new ones could be found. This colony is being watched to find out the reason why there were no new egg-clusters. This colony was near the western border of the town on the water reservation of the city of Hartford. No spraying was done at this place.

MIDDLESEX COUNTY

Two towns in this county were scouted by State men, but only one colony was found, this being in Middletown, nearly in the center of the township, on land of C. S. Wadsworth, where 49 egg-clusters were found on trees and in a stone wall. Five acres of woodland were sprayed by Federal men.

The other town scouted was Haddam, but no trace of the gipsy moth was found.

NEW HAVEN COUNTY

Federal men did all the spraying and scouting in all the towns of this county except Meriden and Wolcott, where State men did the scouting.

Meriden—3 Infestations—48 Egg-clusters

A group of three colonies was discovered by a State crew in Meriden near the center of the town. One of 31 egg-clusters was on shade trees, a fence, and stone wall at 60 Pratt Street, owned by George King. Another, of 13 egg-clusters, was on apple and cherry trees belonging to E. W. Pulley of 154 Miller Street, and the third was a small colony of four egg-clusters on maple trees at 107 East Main Street, owned by E. M. Curtis. Spraying was done at all three places in the spring.

New Haven—1 Infestation—8 Egg-clusters

Federal men scouted New Haven and found one small colony of 8 egg-clusters on land of K. O. Carlson at 45 Sheldon Terrace. Ten apple trees and 150 shade trees, covering parts of several city blocks, were sprayed in and around this colony.

Seymour—1 Infestation—121 Egg-clusters

One large isolated colony was discovered by Federal men while they were scouting this town. Altogether, 121 egg-clusters were found in woodland of the Birmingham Water Company situated on the western border of the town, on the line between Seymour and Oxford. This being an isolated colony and far west of the general infestation, eradication instead of control methods was practiced. All deadwood, both standing and on the ground, together with other refuse, was cleaned up and burned. In the spring before the eggs hatched, all the trees were banded with tree tanglefoot; later, when the foliage was out, the trees in and around this colony were sprayed.

Wolcott—1 Infestation—4 Egg-clusters

State men scouted part of this town, covering about 20 miles of roadside. It was not thought necessary to scout the whole town as no infestation had ever been found except in one small spot. Four egg-clusters were found in a woodland owned by Bessie Wilson, located about three-quarters of a mile north of Wolcott post office; 997 egg-clusters were found at this same place last year. About two acres of woodland were sprayed by Federal men in the spring.

Woodbridge—1 Infestation—499 Egg-clusters

A large colony was found in Woodbridge, containing 499 egg-clusters, on oak, birch and maple trees, and bayberry bushes, in a pasture belonging to S. J. Peck, about one mile south of Woodbridge village. The same methods were used at this colony as at the one in Seymour; namely, cleaning, burning, banding with tanglefoot, and spraying. This work was all done by Federal men.

Nine other towns in New Haven County were scouted by Federal crews: Ansonia, Beacon Falls, Cheshire, Derby, Hamden, Milford, Oxford, Southbury, and Wallingford, but no trace of the gipsy moth was found in any of these towns.

FAIRFIELD COUNTY

All work in Fairfield County this year was done by Federal men. Fifteen towns were scouted, but no trace of the gipsy moth was found. In the Report of this Station for 1926, page 212, mention was made of a large colony in Greenwich containing 328 egg-clusters. The work done there last year brought very satisfactory results, as no trace of the pest was found this year, although very close scouting was done around the old infestation.

The other towns scouted were: Bethel, Bridgeport, Danbury, Easton, Fairfield, Monroe, Newtown, New Fairfield, Redding, Shelton, Stratford, Trumbull, Weston, and Westport.

LITCHFIELD COUNTY

All spraying in this county was done by Federal men who scouted in six towns out of thirteen.

Barkhamsted—8 Infestations—714 Egg-clusters

All the infestations found by State men while scouting Barkhamsted this year were in the eastern half of the town in woodland. The largest was a colony of 545 egg-clusters on land belonging to H. Burdick, located about a mile south of Barkhamsted post office; another, of 55 egg-clusters, was found on land owned by M. Marek, about half a mile farther south. These were the largest and most dangerous. Five of the places were sprayed.

Colebrook—3 Infestations—20 Egg-clusters

Eighteen of the 20 egg-clusters found in Colebrook by State men this year were in one colony situated in the North Colebrook section of the town in woodland owned by Carrington Phelps. The other two were single egg-cluster infestations. About three acres of woodland were sprayed.

Cornwall—1 Infestation—65 Egg-clusters

Federal men found one colony of 65 egg-clusters in Cornwall in the section known as "Swift Bridge," on land of the Dark Entry Forest. About 26 acres of woodland were sprayed.

Harwinton—1 Infestation—10 Egg-clusters

State men discovered one colony of ten egg-clusters in Harwinton, just north of the Campville post office, in woodland owned by Charles Delay. Four acres of woodland were sprayed around this colony.

New Hartford—1 Infestation—26 Egg-clusters

One colony of 26 egg-clusters was found by State men near Bakersville post office in a pasture. The owner's name could not be learned. This colony was so far back from any road that it could not be reached by the spray outfit, so men were sent a number of times during the larval season to scout the trees and kill the caterpillars by hand; 110 larvae were killed in this manner.

Norfolk—1 Infestation—9 Egg-clusters

Federal men found one small colony of one new egg-cluster and eight old ones in woodland owned by E. H. Peasley, in the northeast corner of the town. Spraying was thought unnecessary.

North Canaan—1 Infestation—32 Egg-clusters

One colony of 32 egg-clusters was found in North Canaan this year in woodland owned by James Rosier, on the eastern border of the town, and 47 acres of woodland were sprayed. All work was done by Federal men.

Plymouth—1 Infestation—6 Egg-clusters

A State crew scouted Plymouth and found one small colony of six egg-clusters on a white oak tree on land owned by Mrs. Tolles, in the southeastern corner of the town near the Wolcott line. Three-quarters of an acre of woodland was sprayed around this infestation.

Salisbury—1 Infestation—283 Egg-clusters

The colony found by Federal men while scouting Salisbury was in woodland about one mile west of Amesville village, where 283 egg-clusters were scattered over a large territory on top of the ridge. About 29 acres of woodland were sprayed to control this infestation.

Winchester—1 Infestation—15 Egg-clusters

One colony of 15 egg-clusters was discovered by State men in Winchester about one and one-half miles north of Colebrook station, near the town line, in woodland owned by Henry Terrill and Antonio Passeni. About three acres of woodland were sprayed at this infestation.

Three other towns in Litchfield County were scouted, but no gipsy moth infestations were found in them. The Federal men scouted in Canaan and New Milford around last year's infestations. Thomaston was completely scouted by State men.

STATISTICS OF INFESTATIONS 1926–1927

Towns:	No. Infestations found	No. Egg-clusters creosoted	No. Colonies sprayed	No. lbs. Poison used	No. larvae and Pupae killed	No. Miles Roadway scouted
Windham County:						
Brooklyn...G	4	93	2	110	357	73
Canterbury...	18	1,565	9	378	769	20
Killingly....G	18	993	13	282	1,058	116
Putnam.....G	17	413	15	2,027	621	27
	57	3,064	39	2,797	2,805	236
New London County:						
Colchester....	3	585	3	2,050	0	104
Groton.....	16	389	12	2,977	460	19
Stonington....	9	5,572	9	2,497	1,128	11
	28	6,546	24	7,524	1,588	134
Tolland County						
Andover.....	0	0	0	0	0	42
Bolton.....	2	168	1	450	25	41
Columbia.....	1	127	1	150	0	3
	3	295	2	600	25	86
Hartford County:						
Bloomfield....	0	0	0	0	0	84
Burlington....	4	146	2	250	0	22
Canton.....	4	825	2	2,095	197	40
East Granby..	3	142	2	1,625	5	33
East Hartford.	1	19	1	200	2	59
East Windsor.	0	0	0	0	0	14
Farmington...	3	13	1	330	101	6
Glastonbury..	6	394	5	262	63	101
Granby.....	31	2,873	6	2,395	558	123
Hartford.....	2	48	1	87	9	106
Hartland.....	14	343	8	2,162	218	64
Marlboro.....	0	0	0	0	0	45
New Britain..	4	106	2	600	47	18
Simsbury.....	12	747	4	900	221	80
South Windsor	1	2	0	0	0	78
Suffield.....	7	292	3	437	47	76

Towns:	No. Infestations found	No. Egg-clusters creosoted	No. Colonies sprayed	No. lbs. Poison used	No. larvae and Pupae killed	No. Miles Roadway scouted
Hartford County—*Continued*						
West Hartford	1	14	0	0	0	96
Windsor.....	0	0	0	0	0	7
	93	5,964	37	11,343	1,468	1,052
Middlesex County:						
Haddam.....	0	0	0	0	0	167
Middletown ..	1	49	1	275	14	123
	1	49	1	275	14	290
New Haven County:						
Ansonia.....G	0	0	0	0	0	41
Beacon Falls G	0	0	0	0	0	21
Cheshire....G*	0	0	0	0	0	
Derby.....G	0	0	0	0	0	50
Hamden....G*	0	0	0	0	0	
Meriden.....	3	48	3	637	10	26
Milford.....G	0	0	0	0	0	82
New Haven.G*	1	8	1	212	0	
Oxford.....G	0	0	0	0	0	79
Seymour....G	1	121	1	775	0	47
Southbury..G	0	0	0	0	0	123
Wallingford.G*	0	0	0	0	0	
Wolcott.....	1	4	1	100	0	20
Woodbridge.G	1	499	1	425	0	15
	7	680	7	1,937	10	504
Litchfield County:						
Barkhamsted..	8	714	5	1,975	131	84
Canaan.....G*	0	0	0	0	0	
Colebrook....	3	20	1	175	0	65
Cornwall....G*	1	65	1	1,250	0	
Harwinton....	1	10	1	225	0	26
New Hartford	1	26	0	0	116	14
New Milford G*	0	0	0	0	0	
Norfolk.....G*	1	9	0	0	0	
North Canaan G*	1	32	0	0	0	
Plymouth....	1	6	1	50	0	13
Salisbury....G*	1	283	0	0	0	
Thomaston...	0	0	0	0	0	51
Winchester...	1	15	1	100	0	106
	19	1,179	10	3,775	247	359
Fairfield County:						
Bethel.....G	0	0	0	0	0	49
Bridgeport..G	0	0	0	0	0	242
Danbury....G	0	0	0	0	0	147
Easton.....G	0	0	0	0	0	80
Fairfield.....G	0	0	0	0	0	175
Greenwich..G	0	0	0	0	0	116
Monroe.....G	0	0	0	0	0	74

G, Work done by Federal men

* Scouting done around old infestations

Towns:	No. Infestations found	No. Egg-clusters creosoted	No. Colonies sprayed	No. lbs. Poison used	No. larvae and Pupae killed	No. Miles Roadway scouted
Fairfield County—*Continued*						
Newtown...G	0	0	0	0	0	180
New FairfieldG	0	0	0	0	0	51
Redding....G	0	0	0	0	0	97
Shelton.....G	0	0	0	0	0	92
Stratford....G	0	0	0	0	0	111
Trumbull...G	0	0	0	0	0	70
Weston.....G	0	0	0	0	0	51
Westport....G	0	0	0	0	0	84
	0	0	0	0	0	1,619

G, Work done by Federal men

SUMMARY OF STATISTICS

County	No. Towns Covered	No. Infestations found	No. Egg-clusters Creosoted	No. Colonies Sprayed	No. lbs. Poison used	No. larvae and Pupae Killed	No. Miles Roadway Scouted
Windham.....	4	57	3,064	39	2,797	2,805	236
New London..	3	28	6,546	24	7,524	1,588	134
Tolland.....	3	3	295	2	600	25	86
Hartford.....	18	93	5,964	37	11,343	1,468	1,052
Middlesex....	2	1	49	1	275	14	290
New Haven...	14	7	680	7	1,937	10	504
Litchfield.....	13	19	1,179	10	3,775	247	359
Fairfield.....	15	0	0	0	0	0	1,619
	72	208	17,777	120	28,251	6,157	4,280

Parasites

During the past two years the parasites introduced into this country to aid in the control of the gipsy moth have not been so abundant as in 1924, and their recoveries from egg-clusters gathered in the field have been rather meager. These parasites are brought into the United States by the Federal Bureau of Entomology, and numbers of them are reared at the Parasite Laboratory of the Bureau at Melrose Highlands, Mass. When they are ready in sufficient numbers for distribution, the supply for Connecticut is turned over to State men, who distribute them.

An account of these parasites may be found in the Report of this Station for 1922, page 314. Each succeeding year a report has been given on the number of parasites liberated within the State, and the references to these liberations are as follows: 1923, page 265; 1924, page 271; 1925, page 271; 1926, page 215.

During 1927, only one parasite was liberated in Connecticut and that a minute four-winged fly, *Anastatus bifasciatus,* which is a parasite of the gipsy moth eggs. Altogether, 596,000 of these tiny helpers were liberated in 31 towns. The names of these

towns and the number of parasites placed in each are given in the table below:

LIST OF TOWNS AND NUMBER OF *Anastatus* PARASITES LIBERATED IN EACH TOWN

Town	Amount
Columbia	10,000
Colchester	30,000
Barkhamsted	32,000
Granby	42,000
Simsbury	20,000
Hartland	18,000
East Granby	17,000
Suffield	9,000
Somers	2,000
East Hartford	5,000
Glastonbury	12,000
Canterbury	55,000
Killingly	26,000
Putnam	26,000
Eastford	68,000
Stonington	15,000
North Stonington	10,000
Preston	3,000
Voluntown	3,000
Sterling	25,000
Plainfield	17,000
Griswold	5,000
Brooklyn	35,000
Bolton	11,000
Ellington	3,000
Hampton	5,000
Chaplin	8,000
Ashford	30,000
Union	9,000
Woodstock	23,000
Thompson	22,000
	596,000

DEFOLIATION BY GIPSY CATERPILLARS

No conspicuous defoliation or stripping of trees by gipsy moth caterpillars has ever occurred in Connecticut, though many acres of woodland areas have been successively defoliated in Massachusetts, and many trees killed. It is probable that the thorough and persistent, though intermittent system of scouting and spraying maintained by the State in the older infested portion of Connecticut has prevented any such occurrence. Several large woodland colonies have been discovered in Connecticut and eradicated—some of them ten or more years ago. Had these been allowed to continue unmolested, it is very probable that by this time the infestation would have become so intense that severe defoliation might result.

Learning of severe defoliation in Eastern Massachusetts in 1927, Commissioner Edward F. Hall and William A. Hendrick of the

State Board of Finance and Control, and Messrs. Britton and Ashworth of this Department, made a visit to the region bounded by Taunton, New Bedford, and Fall River on July 12. The party met at Hartford and drove by automobile via Willimantic, Danielson, and Providence to Taunton, where it was met by Mr. C. W. Collins of the Federal Gipsy Moth Parasite Laboratory, at Melrose Highlands, Mass. Turning southward, they made frequent stops to examine experimental plots where tests with sprays or parasites were being conducted by Federal agencies. The party lunched at New Bedford, then drove to Fall River, and ascending a fire tower in a city park, beheld a view of thousands of acres of woodland, mostly oak, largely divested of leaves. The caterpillars were starving and were crawling about in search of food. Many were

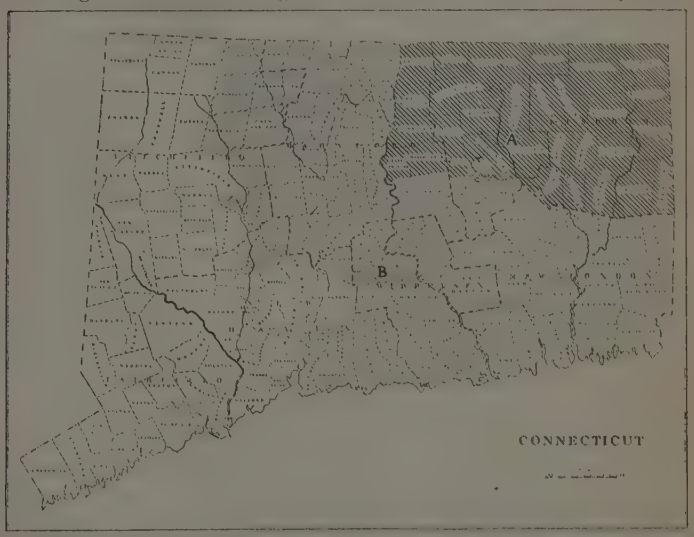

FIG. 38. Map of Connecticut showing areas under Federal and State quarantine on account of the gipsy moth. A, area generally infested; B, area lightly infested.

hanging limply from trunk and twig, having been killed by the wilt disease. The caterpillars do not practice economy in their feeding, but instead of devouring all of the leaf tissue, they often cut off portions of the leaf blades, which drop to the ground. In this park the ground was literally covered with the dried pieces of leaves cut off by the caterpillars. This material was wholly wasted as caterpillar food, for as soon as it became dry the caterpillars could not eat it. Some of the defoliated trees are shown on Plate XXII.

The Gipsy Moth Quarantine

The Federal quarantine concerning the gipsy moth is considered each year and, if certain changes seem to be necessary, the quarantine is revised accordingly. One revision has occurred during the past year, and Fig. 38 shows the present quarantined area in Connecticut. The quarantine order follows:

STATE OF CONNECTICUT
AGRICULTURAL EXPERIMENT STATION
New Haven, Conn.

QUARANTINE ORDER No. 14
Concerning the Gipsy Moth

Inasmuch as the Federal gipsy moth quarantine has been revised and became effective July 1, 1927, it seems best to likewise revise the State quarantine, so that both Federal and State requirements will be uniform. The areas quarantined on account of the gipsy moth in Connecticut were plainly set forth in Quarantine Order No. 9, effective September 20, 1926, and published with map in Bulletin of Immediate Information No. 54, dated October 1, 1926.

Therefore I do hereby declare the towns of Goshen and Litchfield, in Litchfield County, to be free from said quarantine regulations from this date.

Dated July 20, 1927.

W. L. Slate, *Director,*
Connecticut Agricultural Experiment Station.

Approved:
J. Edwin Brainard,
Acting Governor.

OPERATIONS FOR THE CONTROL OF THE EUROPEAN CORN BORER

W. E. Britton and M. P. Zappe

Since the first appearance of the European corn borer, *Pyrausta nubilalis* Hubn., in Connecticut, the scouting and clean-up work have been conducted by this Department and the Federal Bureau of Entomology working in close and harmonious co-operation. An expression of our appreciation and thanks are hereby extended to the Federal men, especially to Mr. L. H. Worthley, administrator in Corn-Borer Control, and to Mr. R. A. Vickery, Assistant Entomologist, in immediate charge of Federal operations in the Connecticut region. Without this hearty Federal co-operation very much less could have been done, with the available State funds, to hold this pest in check.

The succeeding pages give brief accounts of the scouting and control work done in Connecticut in 1927, a summary of Connecticut infestations, and of the establishment of a quarantine.

1926 Infestations

East Lyme.—The clean-up work in this town was nearly completed in December, 1926, when a fall of snow made it necessary to postpone further operations until spring. On March 15, clean-up work was resumed, only two days with the force of men being required to complete the burning in the gardens of the village of Niantic.

Waterford.—There were four separate infestations in Waterford, three of which were on one farm, and the fourth in a garden about one-fourth of a mile distant. The garden area with surrounding weeds was burned over first. The three infestations on the farm were in large corn fields. Most of the corn had been cut and put into the silo, though some was left in the field and some scattered around the farm buildings and along the roadways. All the corn stalks, stubble, and weeds from the field were gathered and burned. Some adjoining fields where potatoes and cabbages had been grown also contained many large weeds, and these were burned over. Altogether, about 40 acres of land were burned over in Waterford.

New London.—There were two infestations in New London, one in a half-acre corn field on Park Street, in the northwestern part of the city, and the other on Montauk Avenue in the southern portion. Both areas were burned over, together with surrounding gardens and weed areas. Altogether, four acres of land were cleaned up in New London. The Park Street area was first found infested with the European corn borer in 1925, and apparently the control measures that year did not entirely eradicate the pest. At least it was again found infested in 1926 and again cleaned up. Though scouted thoroughly in 1927, no borers were discovered.

Groton.—This was the first town in which the European corn borer was found in Connecticut, in 1923, and infestations have been discovered there each year since. For two years the borough of Groton was infested, and one year two infestations were found on the Groton side of the Mystic River. The village of Noank has been infested since the summer of 1925, and though clean-up work has been done each season, the village remains infested. Usually, several infestations have been found each year, but all were in back-yard gardens in the more thickly settled part of the village, and in the clean-up work were treated as one infestation. A majority of the people here are fishermen and lobstermen, and the yards are usually filled with nets, boats, lobster pots, and sheds. It is difficult to burn the corn stalks and weeds without injuring the nets and other property. In the spring of 1927, all corn stalks, weeds, and other plant material which might harbor the borers were removed from the vicinity of the fish nets and then burned. Yards containing no fishing gear were burned over as in other infestations, and altogether about 10 acres were covered. Still, later in

the season of 1927, Federal scouts found the corn borer present in Noank.

Stonington.—In 1926, three separate areas were found infested in the town of Stonington. One was in a small garden in the borough of Stonington, where the clean-up work was a simple matter; another was on Lord's Hill, where two borers were found in a small field of sweet corn; the third area was in the village of Mystic, where several yards were infested. On Lord's Hill, all corn stalks, weeds, and flower stalks in and around the infested field were burned. The owner of the farm feeds his cattle out of doors on corn stalks grown elsewhere on his farm, and all stalks and pieces of stalks left by the cattle were gathered and burned. In the village of Mystic all infested yards and weed areas were burned over. Just south of the railroad station are a few infested corn fields, which were all burned over. About 26 acres of land in Stonington were cleaned up in the spring of 1927.

Summary of Clean-Up Work on the 1926 Infestations

Control operations were carried on in the towns of Milford and East Lyme, from November 16 to December 9, 1926, and recorded in the Report of this Station for 1926 (Bulletin 285), page 239. The work was resumed from March 16 to April 27, 1927, in the towns of East Lyme, Waterford, New London, Groton, and Stonington. All clean-up work was conducted in co-operation with the Federal Bureau of Entomology, which furnished a burner, a ton truck, and part of the labor for both fall and spring operations, and all of the oil used in the spring. The area burned over is given below.

Area Burned

Town	No. Acres
East Lyme	11
Groton	10
Milford	4
New London	4
Stonington	26
Waterford	40
Total	95

Scouting in 1927

During the summer of 1927, Federal men scouted 58 towns in Connecticut, including all shore towns except New Haven, and several towns adjoining shore towns, all towns bordering on Rhode Island except Voluntown, three towns in the northwest corner of the State, and four towns in the center of the State where seed corn is grown. The State of Connecticut paid the wages of the Scouts for a brief time. The towns scouted were as follows:

	NEW LONDON COUNTY	
East Lyme	Lyme	Old Lyme
Groton	Montville	Stonington
Ledyard	New London	Waterford
	North Stonington	
	MIDDLESEX COUNTY	
Chester	Essex	Saybrook
Clinton	Killingworth	Westbrook
	Old Saybrook	
	NEW HAVEN COUNTY	
Bethany	Madison	Oxford
Branford	Milford	Seymour
East Haven	North Branford	Southbury
Guilford	North Haven	West Haven
Hamden	Orange	Woodbridge
	FAIRFIELD COUNTY	
Bridgeport	New Canaan	Stratford
Darien	Newtown	Trumbull
Fairfield	Norwalk	Weston
Greenwich	Shelton	Westport
Monroe	Stamford	Wilton
	LITCHFIELD COUNTY	
Canaan	North Canaan	Salisbury
	HARTFORD COUNTY	
Glastonbury	Newington	Wethersfield
	Rocky Hill	
	WINDHAM COUNTY	
Killingly	Putnam	Thompson
	Sterling	

The northwest corner towns were scouted because the large infestation around Albany, N. Y., has spread almost to Connecticut, but no corn borers were found in Canaan, North Canaan, or Salisbury. Likewise, the large infestation in eastern Massachusetts and Rhode Island has extended nearly to the Connecticut border, and all towns adjoining Rhode Island except Voluntown were scouted. No borers were found in these border towns except in Stonington.

There is an area south of Hartford devoted to seed growing, and considerable sweet corn is raised for seed. Though the towns of Glastonbury, Newington, Rocky Hill, and Wethersfield were scouted carefully, no signs were found of the European corn borer.

In the examination of the shore towns by Federal scouts, the only infestations found were in Milford, East Lyme, Groton, and Stonington. Nothing was found in Waterford and New London, both of which were infested in 1926. After the scouting described

above was nearly finished, Mr. A. P. Harger, who assisted us in nursery inspection, returned to his home in the Quaker Farms section of Oxford, and noticed a borer in an ear of sweet corn. He brought the specimen to the Station, and it was afterward sent to the Federal Corn Borer Laboratory at Arlington, Mass., and identified as the European corn borer. Federal scouts were at once placed in Oxford and scouted not only the entire town but all adjoining towns. Only a few borers were found in Oxford, and these were in two separate infestations, in small corn patches perhaps a half-mile apart. None were found in the surrounding towns.

Stonington

The infestations found in Stonington were near the village of Mystic, and near the village of Stonington, particularly toward the north and east. At Mystic the infestations were: one just south of the railroad station, two east of the village on what are known locally as the Industrial Place and the Hewitt Farm. Another infestation was found at Fair Acres, about two miles north of Mystic, where borers were found in 1925 but not in 1926. The infestations near the village of Stonington were all north of the railroad station and northeastward along the Post Road toward Westerly, R. I. One of these infestations was at Wequetequock about two miles from the borough of Stonington. In 1926 only one small garden was found infested in the borough, and it was well cleaned up.

Altogether, 16 separate fields were found infested with 90 larvae of the European corn borer in the town of Stonington in 1927. No clean-up work has been done, but plans for spring burning are now under way.

Groton

In Groton the 1927 infestations were in two localities: one at Noank, which has been generally infested for several years, and the other on Fort Hill, about one and one-half miles northwest of Noank. The latter infestation was discovered in a field of sweet corn on the Groton town farm, where it will be necessary to clean up the corn, stubble, and weeds on several large fields. At Noank the infestations were all in back-yard gardens, and the entire village will need to be covered in the control operations in early spring.

East Lyme

All infestations in East Lyme were either in back-yard gardens in the village of Niantic, or on small farms just west of the village. This town was one of the first to become infested with the Euro-

pean corn borer, and except for the year 1925, has been infested each year since. Altogether, 17 fields and 140 borers were found in East Lyme in 1927. It is estimated that a thorough clean-up of East Lyme will require that about 35 acres of corn and weeds be burned over in the spring.

Milford

One corn field in the Woodmont section of Milford was found infested in 1926, and careful and thorough clean-up work was done. In 1927 nothing was found in the vicinity, but another infestation was found about two and one-half miles westward, where nine European corn borers were discovered in four corn fields. Three of these fields were on one farm and the fourth on another. Between November 16 and 25, a force of 13 men cleaned and burned over the infested fields and all adjoining fields of corn and weeds. Some of these fields had been seeded to grass between the corn rows, and in such fields the stalks were pulled up, carted away and burned elsewhere, in order not to injure the stand of young grass. This work meant much hand labor, but the stalks and weeds burned with the addition of little or no oil and needed the attention of only one man. The land owners appreciated the danger of allowing this pest to increase or spread and willingly co-operated in the clean-up work. About 18 acres of corn and weeds were burned over in Milford, requiring 91 man days of labor and 5,240 gallons of furnace oil.

Oxford

As has been mentioned, the European corn borer was found in two patches of sweet corn about a half-mile apart in the Quaker Farms' section of Oxford. The clean-up work was done from November 25 to 29, and required 48 man days of labor and 2,120 gallons of furnace oil.

Summary of Connecticut Infestations

Each year for the past five years, the European corn borer has been found at one or more points in Connecticut, though the State is not generally infested. Until 1927, all the infestations occurred in the shore towns. In each case the fields were cleaned and the corn stalks and weeds burned. It is interesting to note that New Haven, Old Saybrook, and Old Lyme have each been found infested only once; Groton, where the first Connecticut infestation was discovered in 1923, has been infested each year since, and Stonington has also been infested each year beginning with 1924.

The following table shows at a glance just where and when infestations have occurred in Connecticut.

EUROPEAN CORN BORER INFESTATIONS IN CONNECTICUT

Towns	1923	1924	1925	1926	1927
Bridgeport		x	x		
Milford				x	x
Oxford					x
New Haven		x			
Old Saybrook			x		
Old Lyme		x			
East Lyme	x	x		x	x
Waterford				x	
New London			x	x	
Groton	x	x	x	x	x
Stonington		x	x	x	x

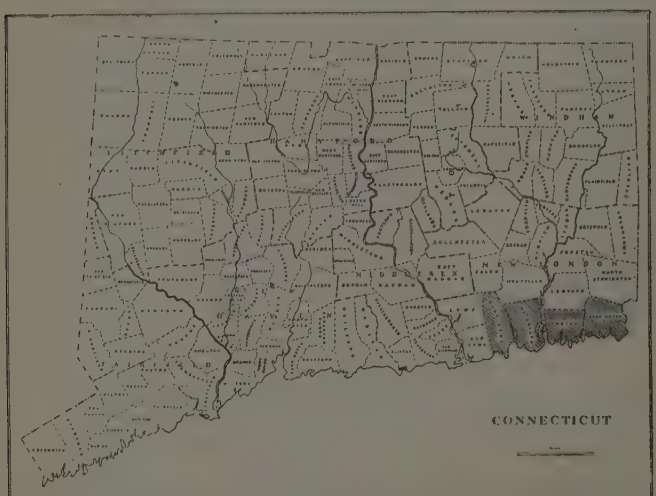

FIG. 39. Map of Connecticut; shaded area shows towns now under Federal and State quarantine on account of European corn borer.

THE EUROPEAN CORN BORER QUARANTINE

The following quarantine order and explanations were published June 1, 1927 as Bulletin of Immediate Information No. 59:

Each year since 1923, a few infestations of European corn borer, *Pyrausta nubilalis* Hubn., have been found by Federal scouts in Connecticut, all being at points along the coast. In each case, corn stalks, stubble, weeds and rubbish have been burned around each infestation, and in some instances no infestation has since been found in the locality. Most of the infestations have occurred in New London County. In 1927, the infested towns were found to be connected through Rhode Island with the large infestation

in eastern New England, and it seemed best to place this territory under quarantine. The Federal quarantine on the towns of East Lyme, Waterford, New London, Groton, and Stonington became effective March 1, 1927, and applies to interstate shipments from these infested towns. After due notice, a hearing was held at New London, May 13, 1927, and a State quarantine placed on these towns by the following Quarantine Order:

STATE OF CONNECTICUT
AGRICULTURAL EXPERIMENT STATION
NEW HAVEN, CONN.

QUARANTINE ORDER NO. 13

EUROPEAN CORN BORER QUARANTINE

The fact has been determined by the Secretary of Agriculture that an injurious insect, the European corn borer, *Pyrausta nubilalis* Hubn., not heretofore prevalent or widely distributed in Connecticut, exists in the towns of East Lyme, Waterford, New London, Groton and Stonington, now, since March 1, 1927, under Federal quarantine. After due notice, a public hearing was held at New London, May 13, 1927, where all persons interested were given a chance to appear and be heard.

Now, therefore, I, Director of the Connecticut Agricultural Experiment Station, pursuant to the provisions of Chapter 107, Public Acts of 1925, do hereby proclaim that the said towns of East Lyme, Waterford, New London, Groton and Stonington are placed under state quarantine, and that it shall be unlawful to move from this area to other points within the state, such plants and plant products, and those only in compliance with the rules and regulations as are designated on the following pages.

RULES AND REGULATIONS

Regulation 1.—Definitions.

For the purpose of these regulations the following words, names, and terms shall be construed, respectively, to mean:

(a) Corn borer: The insect known as the European corn borer (*Pyrausta nubilalis* Hubn.).

(b) Regulated area: Those portions of the state quarantined on account of the European corn borer and designated as being infested or immediately threatened with such infestation.

(c) Inspector: An inspector of the Connecticut Agricultural Experiment Station or the United States Department of Agriculture.

Regulation 2.—Plants and Plant Products Subject to Restriction.

Until further notice, unless accompanied by a certificate or permit issued by an authorized inspector, the following plants and plant materials cannot be allowed movement out of the restricted area: Corn, broom corn (including all parts of the stalk), all sorghums, sudan grass, celery, green beans in the pod, beets with top, rhubarb, oat and rye straw as such or when used as packing, cut flowers or entire plants of chrysanthemum, aster, cosmos, zinnia, hollyhock, and cut flowers or entire plants of gladiolus and dahlia, except the bulbs thereof.

No restrictions are placed by this quarantine on the movement of the articles enumerated, when they shall have been manufactured, processed, or treated in such manner that in the judgment of the inspector no infestation could be transmitted.

Regulation 3.—Infested Areas.

The towns of East Lyme, Waterford, New London, Groton and Stonington, in New London County, Connecticut.

Regulation 4.—Control of Movement of the Restricted Plants and Plant Products.

The movement of the articles enumerated shall not be allowed to any point outside of the areas designated as infested by the corn borer, unless and until such articles have been inspected by an inspector and certified to be free from the corn borer: *Provided*, That certification for movement of corn and broom corn shall be restricted to clean shelled corn and clean seed of broom corn: *Provided further*, That with respect to any article found to be infested with the European corn borer disinfection or treatment may be authorized by the inspector as a condition of certification for interstate movement when in the judgment of the said inspector such disinfection or treatment will eliminate all risk of transmission of infestation—such treatment to be under the supervision of and satisfactory to the said inspector.

The restrictions of these regulations shall apply throughout the year to corn, broomcorn (including all parts of the stalk), all sorghums and sudan grass, cut flowers or entire plants of chrysanthemum, aster, cosmos, zinnia, hollyhock, and cut flowers or entire plants of gladiolus and dahlia, except the bulbs thereof without stems; and for the period between June 1 and December 31 to celery, green beans in the pod, beets with tops, rhubarb, and oat and rye straw as such or when used as packing.

No restrictions are placed on the movement from an area not under regulation through a regulated area of the articles when such movement is made on a through bill of lading.

Regulation 5.—Marking and Certification a Condition of Interstate Transportation.

Every car, box, bale, or other container of plants and plant products of which inspection is required by these regulations shall be plainly marked with the name and address of the consignor and the name and address of the consignee, and shall bear a certificate showing that the contents have been inspected by an authorized inspector and found to be free from corn borer infestation.

The inspection certificates in the case of carload and other bulk shipments shall accompany the waybills, conductors' manifests, memoranda, or bills of lading pertaining to such shipments.

Certificates of inspection will issue only for plants and plant products which have been actually inspected by the United States Department of Agriculture or the Connecticut Agricultural Experiment Station: *Provided*, That when in the case of individual premises or districts within an infested area in any of the quarantined states it shall be determined by competent inspection that the corn borer does not infest any of the cultivated products grown in such premises or districts and that said premises or districts have been maintained in such condition of freedom from weeds or vegetable growths other than the cultivated products designated as to prevent possibility of occurrence of the corn borer through such agencies, a certificate good for not to exceed 30 days may be issued by the inspector stating that such premises or districts have been inspected and found free from the corn borer and free from weeds or other extraneous vegetation capable of harboring the corn borer, and authorizing the shipment from said premises or districts of any of the articles subject to this quarantine grown therein. Copies of such certificate shall be attached to small packages, or, in the case of bulk shipments, to waybills, conductors' manifests, memoranda, or bills of lading pertaining thereto. Reinspection of the premises or district shall be a condition of the granting of further certification.

Regulation 6.—Conditions under Which Plants and Plant Products Originating Outside of the Infested Areas May Be Shipped from Points Within the Infested Areas.

Plants and plant products of which the movement is restricted by these regulations which originate outside of the infested area quarantined for the corn borer may be shipped from points within the infested areas to points outside such areas under permit from the inspector. Permits will issue only for plants and plant products which are not infested with the corn borer, and transportation companies shall not accept or move from within the infested areas such plants and plant products originating outside the infested areas unless each shipment is accompanied by a permit issued by an authorized inspector.

Regulation 7.—Conditions Governing Inspection and Issuance of Certificates

Persons intending to move or allow to be moved plants and plant products for which certificates of inspection are required by these regulations will make application therefor as far as possible in advance of the probable date of shipment. Applications should show the nature and quantity of the plants or plant products which it is proposed to move, together with their exact location and, if practicable, the contemplated date of shipment. Applicants for inspection will be required to assemble the articles to be inspected and so to place them that they can be readily examined. If not so placed, inspection may be refused. All charges for storage, cartage, and labor incident to inspection other than the services of inspectors, shall be paid by the shipper.

Regulation 8.—Thorough Cleaning Required of Cars, Boats, and Other Vehicles before Moving Interstate.

Cars, boats, and other vehicles which have been used in transporting within the infested areas plant products covered by these regulations or any other articles which may hereafter be made subject thereto shall not be moved or allowed to move unless the same shall have been thoroughly swept out and cleaned by the carrier at the point of unloading or destination of all litter and rubbish from such regulated articles. No litter, rubbish, or refuse from any such plants and plant products shall be moved or allowed to move.

Regulation 9.—Provision for Inspection of Restricted Plants and Plant Products in Transit.

Any car, box, bale, or other container of plants or plant products moved or offered for movement, which contains or may contain plants or plant products the movement of which is prohibited or restricted by this quarantine and these regulations, shall be subject to inspection by duly authorized inspectors, at place of shipment or destination or at any point en route.

Regulation 10.—Shipments by the Connecticut Agricultural Experiment Station or the United States Department of Agriculture.

Plants and plant products the movement of which is restricted by these rules and regulations may be moved by the Connecticut Agricultural Experiment Station or the United States Department of Agriculture, when intended for experimental or scientific purposes, on such conditions and under such safeguards as may be prescribed by the Federal Horticultural Board.

This order including rules and regulations shall take effect June 1, 1927, and shall be in force until further notice.

W. L. Slate,
Director, Connecticut Agricultural Experiment Station

Approved:
John H. Trumbull,
Governor.

Of course the purpose of the quarantine is to prevent the shipment of infested material, and it will be unlawful to transport any of the plants or plant material named in the quarantine order to any point outside of the infested area without a permit or certificate. No certificate will be needed for such shipments within the quarantined area.

Penalty

Chapter 107, Public Acts of 1925, provides that "Any person interfering with the performance of such duty or violating the quarantine regulations established under this act shall be fined not less than ten nor more than fifty dollars."

Published Rules and Regulations

Copies of the revised rules and regulations connected with the quarantines established on account of the European corn borer may be obtained from the following sources:

Connecticut Agricultural Experiment Station, New Haven, Conn.
Mr. R. S. Clifton, 12 South Market St., Boston, Mass.
Federal Horticultural Board, Washington, D. C.

Inspections

Arrangements have been made to have a Federal inspector stationed in New London, and he will inspect both interstate and intrastate shipments. His name, address, and telephone number are given below. Applications for inspection should be made to

Mr. Andrew B. Anderson,
Fisher Florist, Inc.,
104 State Street,
New London, Conn.

Telephone 44

FURTHER REPORTS ON SPRAYING AND DUSTING OF APPLES

M. P. Zappe and E. M. Stoddard

This work has been continued in the Frank N. Platt orchard in Milford, where similar experiments have been conducted since 1921. The trees in this orchard are twenty-three years old, growing in sod with nitrate of soda as a fertilizer, and are in good growing condition. Most of them have too much wood, making the operation of spraying and dusting rather difficult and resulting in a large number of small, poorly colored apples. The varieties are: Baldwin, Greening, Gravenstein and McIntosh. The results of former experiments on this subject made by this Station have been published in the Station bulletins and reports as follows: Report for 1920, page 168; Bulletin 235; Bulletin 245; Report for 1923, page 267; 1924, page 286; 1925, page 272; and 1926, page 228.

Acknowledgments

The writers are indebted to Mr. Frank N. Platt for use of his orchard, power sprayer, and other assistance in conducting the experiments; also to Messrs. B. H. Walden, H. B. Bender and A. D. McDonnell, who assisted in scoring the fruit at harvest time. We also wish to acknowledge the assistance of Dr. Florence A. McCormick in making many laboratory examinations of apple scab in various stages of development.

Arrangement of Plots

The arrangement of plots in 1927 is the same as in 1926. The orchard was divided into seven plots of two rows, each running across the orchard, to include all varieties in each plot. One of these plots was used as a spray barrier to prevent dust from blowing upon the trees of the check plot, and no data from the barrier plot are used in making comparisons. The arrangement of plots and schedule of treatment are shown in the following table:

Arrangement of Plots and Spray Schedule

	1 Pre-pink April 25	2 Pink May 5	3 Calyx May 23-26	4 1st after Calyx June 8	5 2d after Calyx July 7	6 3d after Calyx August 3
Plot 1 Rows A & B	Spray	Spray	Spray	Spray	Spray	Spray
Plot 2 Rows C & D	Pomodust	Pomodust	Pomodust	Pomodust	Pomodust	Pomodust
Plot 3 Rows E & F	Kolotex Dust	Kolotex Dust	Kolotex Dust	Kolotex Dust	Kolotex Dust	Kolotex Dust
Plot 4 Rows G & H	Spray	Spray	Spray	Pomodust	Pomodust	Pomodust
Plot 5 Rows I & J	Spray	Spray	Pomodust	Pomodust	Pomodust	Spray
Plot 6 Row M	Check; no treatment	Check; no treatment	Check; no treatment	Check; no treatment	Check; no treatment	Check; no treatment

Only the McIntosh variety received the pre-pink applications of spray and dust.

Materials and Apparatus Used

Spray

Dry lime-sulphur	6 pounds
Lead arsenate	3 "
Water	100 gallons

Pomodust

Sulphur	90 pounds by weight
Lead arsenate	10 " " "

Kolotex Dust

Sulphur	85 " " "
Lead arsenate	15 " " "

All spray applications were made with a Friend Power Sprayer carrying about 175 pounds pressure. Spray rods were used except for the tops of the tallest trees which could not be reached with rods; then a spray gun was brought into use.

Dust applications were made with a Niagara duster. The dust and spray applications were usually made on the same day except at the time of the calyx treatment. At this time it began to rain after the dust had been applied and continued to rain for the next two days, when the spray application was made. The quietest part of the day was selected for dusting, usually either early in the morning or late in the afternoon or evening when the wind had stopped.

Method of Recording Data

The data on results of treatment were taken as in previous years. The method, in brief, consisted of examining all the apples from selected trees in each plot and recording the several injuries and perfect fruit on a series of tally registers arranged on a board so placed on a sorting table that each person scoring fruit could record his own data. This scoring device is described in detail in the Report for 1925, page 273. A total of 130,610 apples were scored on the three varieties used this season. The fruit crop in general was quite light, and on the Gravenstein trees the fruit was so scarce that none was scored and no results on this variety can be presented this year. In certain plots some difficulty was experienced in finding Baldwin and Greening trees with enough fruit to warrant recording the data from them, and some trees had no fruit whatever. The McIntosh trees produced a fairly good crop.

Results of Treatment on McIntosh

	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6
	Spray	Pomodust	Kolotex dust	Spray 1, 2, 3 Dust 4, 5, 6	Spray 1, 2, 6 Dust 3, 4, 5	Check
Good	56.7	55.	63.03	44.9	36.6	.47
Aphis	3.39	3.44	4.17	5.78	5.02	12.42
Red bug	.27	.41	.44	.99	.74	13.31
Codling moth	.11	.197	.09	.12	.11	2.19
Curculio	1.67	3.24	3.14	1.99	3.89	56.9
Eulia	.5	.99	1.15	.52	.58	1.2
Other chewing insects	4.19	9.83	13.18	8.66	10.87	31.3
Scab	36.96	32.7	17.66	45.4	55.6	96.1

Discussion of Results

Kolotex dust gave the best control of scab, while spray and Pomodust were nearly equal. Our records show that the maximum scab spore discharge was at the time of the calyx (May 23-

26), during a three-day rainy period. This rain interfered with the calyx application, the dust being applied just before, and the spray just after the rainy period. This probably accounts for the large amount of scab on the sprayed plots. The difference between the two dusts may be due to the better sticking qualities of the Kolotex dust. There was no sooty blotch or fruit speck present on the McIntosh apples. Red bug was controlled very well by all treatments. The control of curculio was very good for all treatments and much better on this variety than on either of the other varieties. In all cases the amount of curculio injury on the check trees was heavy, but the percentage of injury was less on the McIntosh than on either Greening or Baldwin. The Eulia injury was very light on this variety.

RESULTS OF TREATMENT ON GREENING

	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6
	Spray	Pomodust	Kolotex dust	Spray 2, 3 Dust 4, 5, 6	Spray 2, 6 Dust 3, 4, 5	Check
Good	54.4	57.5	54.7	56.7	48.3	5.16
Aphis	28.4	13.8	18.1	21.4	19.8	14.2
Red bug	.25	.17	0	0	.06	24.2
Codling moth	.38	.40	.78	.37	.41	11.3
Curculio	11.38	17.3	17.2	11.4	14.9	60.1
Eulia	3.29	4.85	3.22	3.81	2.74	4.12
Other chewing insects	2.37	7.45	5.4	3.22	5.19	19.6
Scab	2.3	.74	1.4	.4	1.07	3.87
Sooty blotch	2.14	1.07	4.2	.58	5.46	33.2
Fruit speck	1.83	1.82	3.85	4.2	12.9	15.2

DISCUSSION OF RESULTS

The amount of good fruit was nearly the same on all treatments. The per cent of aphis injury is very much less on check trees than on any of the treated plots. This fact has been noted several times during these experiments and has recently been explained by the fact that aphids are attracted by the white color of the dusts and spray residues, and by the fact that some of their parasites are killed by the treatments.* Good control of red bug and codling moth was obtained by all treatments, with only a fair control of curculio on all plots but best on those having liquid spray. Eulia injury was heavier on this variety than on the McIntosh but not as heavy as on Baldwin.

* Folsom, J. W. Jour. Ec. Ent., Vol. 20, page 840.

RESULTS OF TREATMENT ON BALDWIN

	Plot 1 Spray	Plot 2 Pomodust	Plot 3 Kolotex dust	Plot 4 Spray 2, 3 Dust 4, 5, 6	Plot 5 Spray 2, 6 Dust 3, 4, 5	Plot 6 Check
Good	59.2	64.5	30.6	60.7	26.6	1.62
Aphis	21.7	16.1	34.4	15.06	28.9	1.97
Red bug	0	0	1.25	.19	1.21	5.59
Codling moth	.51	.92	0	.46	.28	1.54
Curculio	7.95	11.5	17.1	13.2	16.01	48.2
Eulia	5.15	4.25	2.39	1.01	2.23	40.2
Other chewing insects	3.35	4.6	6.84	2.35	5.17	16.3
Scab	0	0	0	.028	0	.43
Sooty blotch	1.28	.92	9.22	3.72	13.47	60.5
Fruit speck	6.32	1.84	20.1	9.2	28.05	45.7

DISCUSSION OF RESULTS

On Baldwin the highest percentage of good fruit was from the Pomodust plot. The other dusted plot (Kolotex dust) was very low in good fruit, largely because of the high percentages of aphis and fruit speck. Here, again, the check plot had less aphis injury than any of the other plots. Codling moth injury was very light on all plots, including the check, but curculio injury was heavy and was best controlled by liquid spray. Both Eulia and other chewing insects were plentiful on check trees but were fairly well controlled by all treatments. Sooty blotch and fruit speck were quite plentiful and were fairly well controlled except in the Kolotex dust plot and the combination plot No. 5, receiving both spray and dust.

SUMMARY OF RESULTS ON ALL VARIETIES

	Plot 1 Spray	Plot 2 Pomodust	Plot 3 Kolotex dust	Plot 4 Spray 1, 2, 3 Dust 4, 5, 6	Plot 5 Spray 1, 2, 6 Dust 3, 4, 5	Plot 6 Check
Good		G B	M			
Aphis	M	G		B		
Red bug	M B	G B	G			
Codling moth			M B	G		
Curculio	M G B					
Eulia	M			B	G	
Other chewing insects	M G			B		
Scab	B	B	B M	G	B	
Sooty blotch		B		G		
Fruit speck		G B				
	10	9	6	6	2	0

B, Baldwin; G, Greening; M, McIntosh

SUMMARY

As a method of comparison of the relative values of the different treatments we present the foregoing table. In this table the first letter of the variety is arranged opposite the several injuries, under the treatment which gave best control of that particular trouble. For example, the highest per cent of good fruit was obtained by the Pomodust treatment on Greening and Baldwin, and by Kolotex dust on McIntosh.

At the foot of each column may be seen the figures representing the total number of points scored for that particular treatment. It will be seen that liquid spray has a total of ten points, and the second best treatment was Pomodust with nine points. Kolotex dust and the combination plot having the first three treatments of spray and the last three of Pomodust both have six points. The plot having the first, second, and sixth treatments of spray, and the third, fourth, and fifth of Pomodust scored only two points.

The results of the work this year show nothing very striking except the fact that the dust treatments have given better control of scab than the liquid spray, but allowances must be made for the delay in getting liquid spray on the trees at the time of the calyx application when scab infection took place.

CANKERWORMS IN NEW LONDON COUNTY

M. P. ZAPPE

Cankerworms were very plentiful in several of the shore towns in New London County, and many small groves of trees along the roadsides were nearly defoliated. In the town of East Lyme, at what is known as Point O' Woods, an oak grove was nearly stripped of leaves. The grove consists mostly of white and red oaks. The cankerworms apparently preferred the white oaks, as these were defoliated, while oaks of the red or black type were not so badly injured.

There are many summer cottages in this grove, and hardly any one lives there except during the summer months. When the larvae were most abundant (about June 16), only a few of the summer people had moved into the grove. These people were very much alarmed about the defoliation of their trees. The larvae were nearly full grown, and many were coming down to pupate. Others were leaving defoliated trees for some that still offered some food. Larvae when leaving the trees come down on threads, and it was impossible to walk under the trees without getting

covered with worms. Larvae were crawling all over everything and were very plentiful on the sides of the houses. In some cases they were so abundant that one could hardly see the color of the house. The women were particularly annoyed by larvae crawling into the houses through open windows, doors, etc., and no clothing could be hung out while larvae were present.

Many of the larvae on the buildings were either dead or dying, having been attacked by some of the bacterial diseases which sometimes kill large numbers of larvae in a short time. Predaceous insects and birds were also present and seemed to be killing many

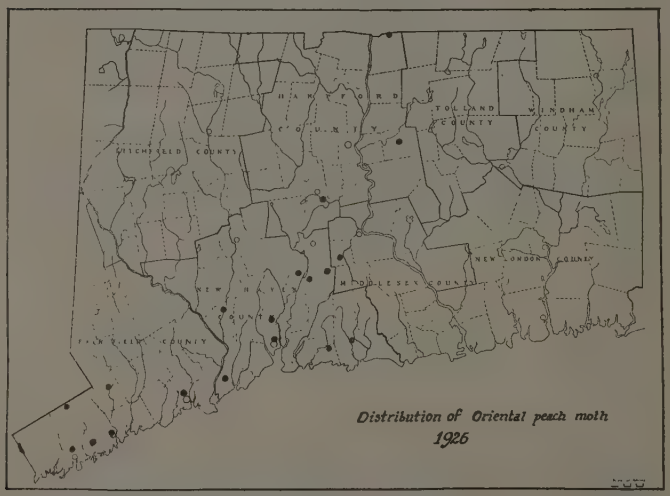

FIG. 40. Map of Connecticut showing recorded distribution of the Oriental peach moth in 1926.

of the cankerworms. One of the large ground beetles, *Calosoma scrutator* Fabr., was doing good work, and the adults were seen on the trunks of the trees, devouring the cankerworms.

We were informed that some cankerworms were present in 1926, but not in such numbers as in 1927. When most of the summer inhabitants arrived, early in July, the cankerworms had all disappeared. Later in the summer the trees had all leafed out again, and few indications could be seen of the early outbreak of cankerworms.

THE ORIENTAL PEACH MOTH IN CONNECTICUT

PHILIP GARMAN

The Oriental peach moth has now been in Connecticut ten years, to the best of our knowledge. Since its first introduction or discovery in 1917, it spread slowly at first, but with more and more speed during the 20's, so that it is found in seven of our eight counties and is becoming very abundant in some localities. During the last season it appeared in all districts where it had been previously found. It now infests nearly every orchard in Fairfield County and is doing great damage in Hartford and Middlesex Counties. It has not yet been found in Windham County, where, however, few peaches are grown. Figs. 40 and 41 show its occurrence in 1926 and 1927, determined by similar means. A comparison of the two charts shows a distinct gain on the part of the peach moth in 1927. There has also been a distinct increase in the infestation of quinces, and we have learned of at least one orchard severely infested in 1927. The only case where we have been able to detect much reduction in fruit injury since the moth became prevalent is in Wallingford where experimental work was done. Here there has been a successively decreasing infestation since 1925, and the infestation this year did not average much over 10 per cent in any part. We attribute this to parasitism, and thorough cultivation of the soil by the owners.

Our work this year consisted of maintaining bait pans, applications of insecticides in the field, cage records, and tests of a number of different larvicides and ovicides, as well as sprays which might prevent the adult moths from laying eggs.

The bait pan work consisted of the maintenance of two lots of bait pans, one a comparison of protected tin pails versus enamel stew pans—consisting of about twenty pails of each kind—and another series comparing rusty tin pails with pails protected on the inside with linseed oil. The total catch during the season is as follows:

COMPARISON OF PROTECTED TIN PAILS WITH ENAMEL STEW PANS

	Average for season per pail
A Tin pails (23) protected on the inside with white paint; outside with linseed oil	28
B Enamel pans (20)	26
Total catch in 43 pails	1167

COMPARISON OF RUSTY PAILS WITH PAILS PROTECTED ON INSIDE WITH LINSEED OIL

A Rusty pails (10)	1.1
B Rusty pails protected with linseed oil (10)	4.6

The bait used was a thick, refiners' syrup diluted 1 quart to 5 gallons of water, or 1 part to 20 parts of water. This syrup seems to work better than the molasses used last year in that it does not ferment quite as rapidly, and the bait does not become choked with noctuid moths during periods when these insects are numerous. However, the usual difficulties were encountered in pail maintenance, namely, the dilution of the bait due to heavy and incessant rainfall during the summer and evaporation during dry periods. It would apparently be desirable if the fermentation could be stopped by the addition of preservatives after the most effective period is reached, since continuation of fermentation results in

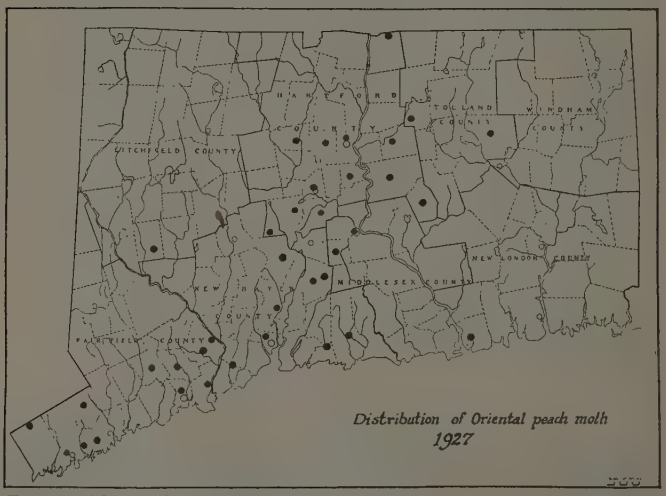

FIG. 41. Map of Connecticut showing recorded distribution of the Oriental peach moth in 1927.

foul-smelling mixtures eventually without any attractive powers whatever. The total catch from 43 pails was 1,167 moths, of which presumably half were females. This means a total of 27 per tree, or 9 per brood per tree. This figure is evidently not high enough to afford protection, since many more may develop on a single tree during the latter part of the season.

It seems advisable to report at this time life-history data including both insectary studies at New Haven and bait pan records obtained at Wallingford. This information is given in the table on page 267 and in Fig. 42. We have been unable to obtain more

than a partial fourth generation, and there have been no signs of this since 1925. Fig. 42 shows the periods of adult abundance in 1926 and 1927 in a commercial peach orchard and indicates that the first adults begin to emerge shortly after the first of May. This also corresponds to our earliest emergence date in the insectary at New Haven, where the first moths emerged April 29. The peak of emergence, however, was not reached until about the first of June in New Haven, and the abundance in bait pans at Wallingford indicates the first of June or later. The moths continue to fly until cold weather, and have been caught several weeks after the crop is harvested. It is evident that a great difference in time of spring emergence is made by the position in relation to sunlight. Observations in cages during 1925 indicated that a

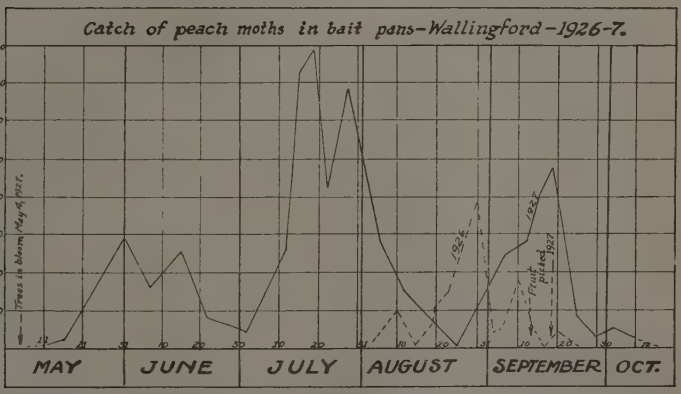

FIG. 42. Periods of adult Oriental peach moth activity in 1926 and 1927. This shows the relative abundance at different periods during the summer.

majority of the larvae spinning on the trunk spin on the north side of the tree. In the orchard, however, they may be found in different locations, although the majority spinning on the tree have been found on the north side. From the following data it will be seen that those protected from sunlight emerge much later than those not thus protected. The moths used in this experiment were all obtained from the same source and were placed in a wire cage with a board partition protecting half the cocoons from the direct rays of the sun. There was no glass between the cage and the sun, and the larvae were placed on a bench in an open insectary. The period of emergence is seen to be somewhat over seven weeks, beginning the 29th of April and continuing until June 23. The cocoons were constructed in paper cells.

RESULTS OF PROTECTION FROM SUNLIGHT ON THE SPRING EMERGENCE OF ADULT MOTHS

Date of emergence	Unprotected from sun	Protected
April 29	2	0
May 1	3	0
3	1	0
4	1	0
5	3	0
6	2	0
8	1	0
12	3	0
16	0	0
23	0	1
28	0	2
31	0	2
June 3	0	1
6	0	3
8	0	1
9	0	2
11	0	1
13	0	1
14	0	1
15	0	1
20	0	1
22	0	1
23	0	1
Total.....	16	19

Life History Data On the Oriental Peach Moth
1925 – 1926

INCUBATION OF THE EGG—DAYS

	First Brood			Second Brood			Third Brood			Fourth Brood			Total observations
Date	No. observed	Average	Range	No. observed	Average	Range	No. observed	Average	Range	No. observed	Average	Range	
1925	276	9.0	3–13	155	4.8	4–6	39	4.9	4–6	34	7.6	6–11	
1926	268	9.3	6–16	125	4.9	2–6	142	5.3	3–7				
Aver. for 1925–6	344	9.1	3–16	280	4.8	2–6	181	5.1	3–7	34	7.6	6–11	839

LARVAL FEEDING PERIOD—DAYS

	No. observed	Average	Range	No. observed	Average	Range	No. observed	Average	Range				
1925	26	15.4	13–20	42	13.2	10–17	16	16.5	12–28				
1926	63	15.8	12–27	64	12.4	10–21	92	19.8	14–34				
Aver. for 1925–6	89	15.6	12–27	106	12.8	10–21	108	18.1	12–34				403

COCOONING AND PUPAL PERIOD—DAYS

	No. observed	Average	Range	No. observed	Average	Range	No. observed*	Average	Range				
1925	17	13.4	9–17	36	13.3	9–16	11	13.2	12–16				
1926	78	12.8	8–15	72	12.5	8–18							
Aver. for 1925–6	95	13.1		108	12.9	8–18	11	13.2	12–16				
Egg to Adult	Sum	37.8	23–60		30.5	20–45	11	36.4					214

TOTAL PERIOD**—EGG TO ADULT—DAYS

	No. observed	Average	Range	No. observed	Average	Range	No. observed	Average	Range				
1925	30	35.2	29–43	66	32.4	29–38	22	281.7	271–294				
1926	102	39.0	31–49	80	30.3	26–37	56	286.8	259–318				
Aver.	132	37.1	29–49	146	31.3	26–38	78	284.2	259–318				356

*Only those emerging before winter are recorded.

**Records of continuous periods from egg to adult.

These emergence data combined with bait pan records have an important bearing on the time for cultivation to control the larvae pupating on the ground, in view of which it is recommended that the cultivation be complete by the first of May, if possible, and by no means delayed after the middle of that month.

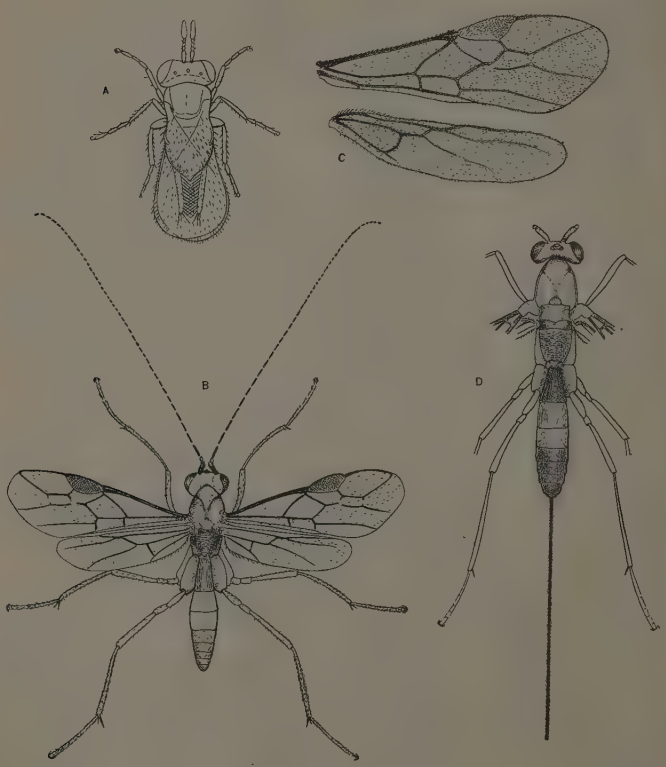

FIG. 43. Parasites of the Oriental peach moth. A, an egg parasite, *Trichogramma minuta* Riley; B, C, D, *Macrocentrus ancylivora* Rohwer; B, male; C, wings of female; D, body of female. All much enlarged.

The parasite *Macrocentrus ancylivora* Rohwer (Fig. 43, b, c and d) was observed to be very numerous at Wallingford, and no doubt was partly responsible for the decrease in infestation there. This insect was originally studied in the United States as a parasite

of the strawberry leaf roller, *Ancylis comptana* Fröhlich. It has been thought that the parasite possibly winters on this host, but a search for the host revealed none in the immediate vicinity of the orchard where the parasite was most abundant. However, there are probably many other leaf rollers which might serve as a winter host, some of which were caught in large numbers in bait pans.

The egg parasite *Trichogramma minuta* Riley (Fig. 43, a) was obtained from California with a view to establishing it in infested orchards. Success has been reported by Flanders* in the control of the codling moth in walnuts, using large numbers reared in the eggs of the Angoumois grain moth, *Sitotroga cerealella* Oliv. Some of these parasites were released, but it will probably be necessary to rear them in large numbers each year for release in infested districts in order to get them established.

A considerable number of preliminary field tests were made with a view to developing an arsenical substitute which might be used safely on peaches. Most of the work dealt with oil emulsions designed for ovicides, and fluosilicates to poison the larvae. Sodium fluosilicate was used but caused burn under ordinary conditions of application. However, the presence of bark cankers is absent, when this material is used, although the foliage may be severely scorched. It was discovered that the addition of ground glue and lime to a mixture containing sodium fluosilicate was successful in prevention of spray burn on the foliage. On early peaches and young trees the applications were harmless. In our field experiments at Wallingford, where some fifty bearing trees were sprayed with the same formula (8 lbs. to 200 gallons), no injury to the foliage was apparent, although the application caused a small amount of fruit crack. However, there was some splitting on unsprayed trees in this orchard, and the damage was therefore considered slight. A modified formula containing flour, sugar, and other ingredients, including fluosilicate used in another orchard, caused severe cracking of the fruit, although there was no apparent injury to the foliage. The effect of these field tests in control of fruit infestations is shown on page 270, and results with this mixture should be read from the "old injury" column. It was also learned that white oil emulsions may be used in this locality on peaches sometimes without injury, at strengths amounting to 2⅜ per cent of oil emulsion—about 2 per cent of actual oil content. In one test three six-year trees were sprayed with dry-mix, followed by white oil emulsion after the material dried on the foliage. No injury resulted. Combinations of nicotine sulphate, wormseed oil, and oil of citronella with the white oil emulsions were also used without injury.

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* Jour. Econ. Ent., 20:644:1927.

However, satisfactory kills of the eggs were not obtained in insectary tests under 5 per cent strength or 4 per cent on a pure oil basis. Consequently it was thought advisable to add nicotine to the spray mixture as applied in the field in order to increase its killing power.

Work with artificial foods was also continued with results similar to those obtained in 1926. It is evident that larvae feed and develop on these mixtures, in which several instars may be successfully passed. This year small amounts of magnesium citrate and other substances were tried, and the results seemed to be better than last year in the development of the larvae. Several larvae completed the third instar, while one larva passed through the two final instars, pupated, and emerged as adult. The mixture consisted of the following materials:

Confectioners' sugar	10 grams
Citric acid	.5 "
Magnesium citrate	.5 "
Wheat flour, white	50 "
Water	30 cc.

It is noticeable that the periods of existence are greatly lengthened from feeding on artificial mixtures, a condition apparent both in 1926 and 1927.

RESULTS OF SPRAYING EXPERIMENTS FOR CONTROL OF ORIENTAL PEACH MOTH—1927

Treatment	Average % Infested	New Injury	Old Injury	Variation in % infested	Total amt. fruit examined	Notes
Sprayed	9.2	5.3	3.9	1–16.0 2–13.7 3–17.2 4–8.4 5–5.4 6–8.2 7–5.5	702	Spray dates July 5, July 22, August 29, September 8. This was in addition to regular sulphur dust treatment by owner.
Pail in every tree	13.9	7.8	6.0	1–18.3 2–28.0 3–20.3 4–15.8 5–10.5 6–7.5 7–15.4 8–1.4 9–14.3 10–14.3	775	Pails hung May 1. Material already fermenting when started. Pails filled June 15. First ten, each series filled July 12; all rest July 22; all refilled Aug. 5; first ten, each series, Aug. 25; all rest filled Aug. 30; all refilled Sept. 30.

Treatment	Average % Infested	New injury	Old Injury	Variation in % infested	Total amt. fruit examined	Notes
Check—dust only	14.5	6.2	8.3	1–21.3 2–33.8 3–34.8 4– 6.9 5–13.7 6–12.1 7– 4.0 8–31.8	747	

Formula used on sprayed plot:

July 5 Sodium fluosilicate..... 4 lbs.
Glue..... 4 "
Lime..... 40 "
Water.....200 gals.
July 22 Same with 8 lbs. fluosilicate instead of 4.
Aug. 25 White oil emulsion ..... 4¾ gals.
Oil of citronella..... 3 oz.
Nicotine sulphate..... 1 pt.
Water.....200 gals.
Sept. 8 Same as August 25.

Recommendations

At the present time our recommendations for control of the Oriental peach moth consist of (1) cultivation before the first of May and continually thereafter until August. Complete cultivation should be practiced, breaking the soil as near to the trunks of the trees as possible. (2) Use of paradichlorobenzene the same as for peach borer control. It is, of course, recognized that these recommendations will not afford complete control but are the best that can be offered at this time.

WEATHER CONDITIONS ACCOMPANYING THE APHID OUTBREAK IN CONNECTICUT IN 1927

Philip Garman

The unusual outbreak of aphids in orchards in 1927 has not been equaled in the State for many years. Not only did the rosy aphis become abundant, but almost every species that occurs on fruits and other plants was abundant and injurious. It is worth while, therefore, to summarize the weather conditions prevailing at the time. In many orchards surveyed at the beginning of the

growing season, few or no aphid eggs were to be found, and in general the aphids and eggs were scarce throughout at this time. Whatever development occurred then must have been due to conditions immediately following this period. It was noticed also that the aphids suddenly disappeared about the middle of July so that, in Connecticut at least, the periods most profoundly affecting plant lice in 1927 lay between the first of May and the middle of July.

The weather during both May and June, 1927, was unusually cool and rainy. The mean daily temperature as shown in Fig. 46 remained between 50° and 60° F. during the whole of May, and

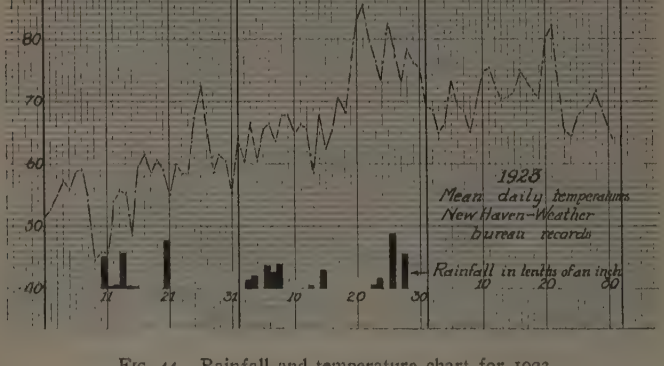

FIG. 44. Rainfall and temperature chart for 1923.

between 60° and 70° during June, rising above 70° only for a few days near the tenth of June and the twenty-third of June, and then only for a day in the orchard. During both May and June the rainfall was nearly twice the normal precipitation.

For comparison, similar diagrams (Figs. 44 and 45) were made for 1925, when aphids were generally scarce, and in 1923, when they were recorded as unusually abundant. The 1923 records show conditions similar to those of 1927 up to June 20, when the mean temperature rose to 80° F., according to New Haven Weather Bureau records. Similarly, during May and June, 1923, the rain-

fall was nearly twice the normal amount. In 1925, there occurred during the early part of June a period of high temperatures when the mean daily temperature averaged above 70° for a week. This was probably effective either in promoting the development of parasites or the increase in migratory instinct among the aphids themselves so that they disappeared from the trees.

During 1926, aphids were moderately abundant, but the weather records indicate only one half the normal amount of rainfall for these two months, although the temperature remained cool, not

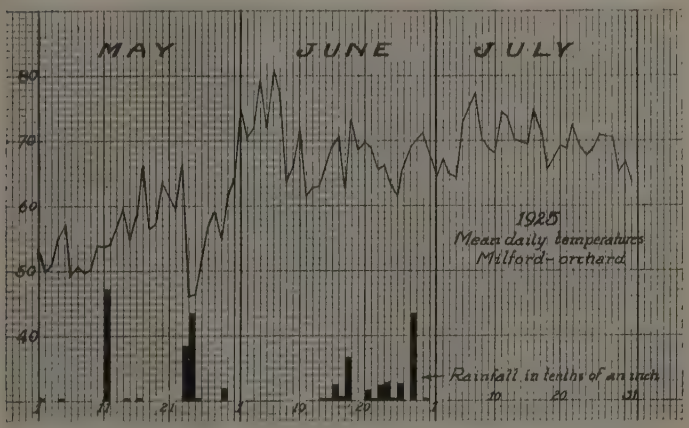

FIG. 45. Rainfall and temperature chart for 1925.

averaging over 70° for any period of time until after the first of July. From this it would seem that abundance of aphids was dependent upon the combined effects of rainfall and temperature. In this connection humidity was also studied, but from the data at hand, as shown in the following table, it is difficult to observe any correlation (even when combined with temperature) between this factor and the abundance of aphids in the field.

COMPARISON OF TEMPERATURES AND HUMIDITIES IN 1925, 1926 AND 1927

Dates	Year	Mean[1] Relative Humidity	Mean[2] relative humidity during day 8 A. M. 8 P. M.	Rainfall[3] Inches	Mean[4] Temperature	Aphid Abundance
May 1–10	1925		55.7	.02	52.2	
11–20			60.2	1.76	58.1	
21–31			59.5	2.29	56.5	
June 1–10			65.0	.07	73.6	Light
11–20			59.0	1.00	66.7	
21–30			67.5	2.28	66.9	
July 1–10			72.0	1.81	69.2	
11–20			62.2	.78	70.6	
May 1–10	1926	66.5	54.7	.20	53.8	
11–20		69.8	62.2	1.04	58.3	
21–31		68.1	63.8	.32	55.4	
June 1–10		71.8	64.4	.41	58.9	Medium
10–20		83.5	63.0	.62	59.9	
20–30		81.0	67.6	.94	65.2	
July 1–10		82.6	66.1	.60	68.9	
11–20		82.9	72.3	1.69	66.7	
May 1–10	1927	72.7	61.7	1.00	52.3	
11–20		77.8	71.1	.48	55.1	
21–31		80.0	74.1	3.16	53.8	
June 1–10		72.0	55.7	1.21	61.4	Very abundant
11–20		77.0	61.7	.63	60.0	
21–30		76.0	66.2	1.22	63.9	
July 1–10		79.4	65.4	1.13	65.3	
11–20		81.5	77.1	.91	72.5	

[1] Mean daily relative humidity from hygrograph obtained in orchard at Milford, Conn.
[2] Average of daily humidities 8 A.M., noon, and 8 P.M. from New Haven Weather Bureau.
[3] Rainfall—midnight to midnight, from New Haven Weather Bureau.
[4] Mean daily temperature, average of 12 records from thermograph sheets obtained in an orchard at Milford, Conn. Machine placed in branches of tree.

In view of the absence of any discoverable relation between humidity and abundance* of aphids in 1926 and 1927, the hythergraphs of the periods between May 1 and July 1 were studied and plotted, as shown in Fig. 47. By first constructing that for 1927, using mean temperatures for each 10-day period between the first of May and the first of July, it appears to be possible to show a relation between these factors and the outbreaks in previous years. Thus, for 1925, two of the figures representing the mean daily temperatures and the combined rainfall for each 10-day period fall within the quadrangle limited artificially by horizontal and vertical lines representing limits of rainfall and temperature.

* See Headlee, Jour. Econ. Ent., 71, page 416, 1914 in this connection.

That year aphids were scarce. In 1923, when they were quite abundant, but not so abundant as in 1927, four periods fall within the limited area, while in 1927 all six periods fall within. Eight periods for 1927 are shown on the chart for the reason that aphids began to disappear only after period 7, or between July 10 and 20. In 1926 (not shown on the chart), four of the six periods fall within the limited area, the others being outside because of the small amount of rainfall or high temperature.

The prediction of an outbreak based upon such data would, of course, be limited by the ability of the weather forecaster to predict similar conditions, but it would seem not impossible to predict such conditions two or three months in advance. It may be also

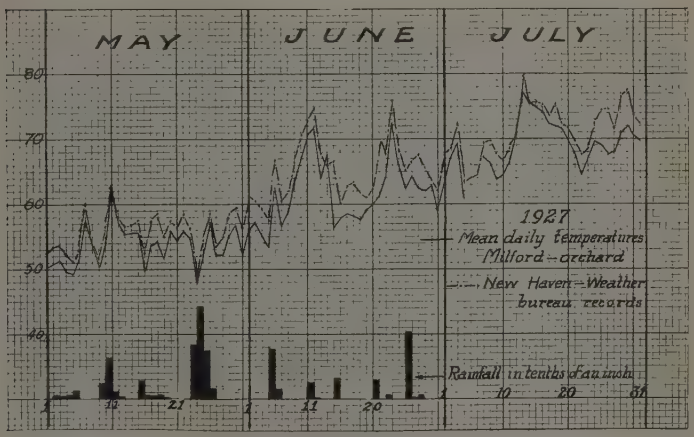

FIG. 46. Rainfall and temperature chart for 1927.

that the limited area does not represent true optimum conditions, but it seems impossible to conceive of a worse outbreak of aphids in general than occurred in 1927, and for this region, at least, probably represents the optimum range of temperature and rainfall necessary for their maximum development.

In connection with rainfall in relation to aphid abundance, it may be that the rank, succulent growth produced by frequent rains plays a much more important role than actual humidity of the air. Thus Headlee (3) showed that some aphids reproduce at a maximum rate provided succulent tissues are available, regardless of humidity (37%-100% relative humidity). Lathrop (4) makes the

statement (page 987) that "plant growth frequently constitutes a factor limiting the rate of development of *Aphis pomi* feeding on slowly growing foliage," while Davidson (2) says, (page 501): "In those series where the soil was treated with complete mineral manures an increased infestation compared with unmanured soil series occurred in every case." It would thus seem that the growth of the plant is most important in aphid outbreaks of the kind experienced in 1927, and it seems reasonable that rainfall should indirectly be a factor of considerable importance. Heavy dashing rains, on the other hand, doubtless destroy many aphids, but from the data available they did not have much influence in keeping down the infestation of last year. Probably a continuous rainy

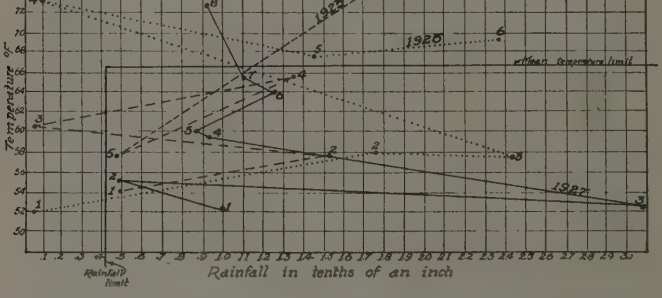

FIG. 47. Combined chart (hythergraphs) showing mean temperature and rainfall by 10-day intervals beginning May 1. Nos. 1, 2, 3, etc., represent intervals from May 1-10; 11-20; 21-31, etc.

period when the ground is kept soaked is more effective in bringing about optimum conditions of growth than infrequent downpours.

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TESTS WITH INSECTICIDES DESIGNED TO DO THE WORK OF NICOTINE SULPHATE

PHILIP GARMAN

The prevailing high price of nicotine sulphate* is leading to considerable activity on the part of manufacturers to produce an insecticide that will take its place. Samples of such products have been received in increasing numbers and it may be worth while to mention here some of the most promising and their effects upon insects.

INSECTICIDES DERIVED FROM DERRIS

Derris is an East Indian plant used as a fish poison. The parts used mainly are the roots from which there are obtained derris resins, the active principle being a so-called tubatoxin. (The root is known by some as tuba root.) It has been well demonstrated that these ingredients are active aphicides working much the same as nicotine sulphate. One of the commercial preparations was tried this year against the mealy plum aphis and showed good killing power, although it failed to accomplish a thorough clean-up on account of poor spread. It is quite evident that soap or casein lime is needed in combination. The product investigated does not mix well with winter strength lime-sulphur solution.

PYRETHRUM EXTRACTS

These materials have been coming into prominence because of their great use in household remedies and the recent demonstration of their general killing ability not only against sucking insects but against such pests as the Japanese beetle and other chewing insects. They have been advertised as almost universal insecticides, one company, in fact, offering a reward for any insect which their product will not kill. It seems evident, however, that any product of this kind cannot wholly take the place of an insecticide like lead arsenate, which remains on the plant for a considerable period, protecting it from invasions of pests not on the plant at the time of the application, and it seems apparent also that there is much to be desired in the way of compatibility with other insecticides and fungicides, if we are to be able to use them extensively. There have been offered three types of pyrethrum insecticides—the kerosene extracts, mostly for household use, the soaps, and the alcoholic extracts.

The soap-pyrethrum combinations will, of course, not be suitable for use in combination with lime-sulphur solution, but they can probably be combined with Bordeaux mixture for use on some crops. It is not advisable to use pure kerosene extracts on any

* The price of nicotine sulphate has dropped since the article was written.

plant foliage. The alcoholic extracts, however, show promise of combining with the usual insecticides and fungicides, but very little is known of them and their effects on plants in combinations with these substances. Likewise, not much is known concerning their keeping qualities; that is, of the original extracts and their possible loss of insecticidal properties.

Both derris and pyrethrum, then, have considerable value as aphicides, but their success for orchard use will depend on their ability to combine with other insecticides and fungicides. The present cost does not seem to be any lower per 100 gallons of spray mixture than nicotine sulphate, and we do not have any reliable information regarding their keeping qualities. The only advantage that can be seen from using the above-mentioned aphicides in an orchard will lie in increased safety of the operator.

TESTS WITH DERRIS AND PYRETHRUM AGAINST THE MEALY PLUM APHIS

	Substance[1]	Dilution	Kill, per cent
A	Derris preparation	1 oz. —6 gals.	88.3
B	"	2 oz. —6 gals.	97.6
C	Pyrethrum soap	2 lbs. —3¾ gals.	94.4
D	Nicotine sulphate	1 oz. —6 gals.	92.2
E	Check—no treatment		0

[1]Commercial preparations in all instances.

THE CARROT RUST FLY

Psila rosae Fabr.

Carrots, celery, parsnips, and parsley are often injured by larvae which tunnel in the fleshy roots. The galleries are rusty in color and are very conspicuous in a parsnip or white carrot, as shown on Plate XXX, b. The tunnels may extend through the root in any direction, and when seriously infested the root may be riddled with burrows. Decay soon sets in and the lower part of the root breaks off in harvesting. Sometimes the infested plants wilt and die.

The insect has long been known as a pest in Europe, and was first discovered in North America in 1885, when carrots purchased in the market at Ottawa, Canada, were found to be mined and infested with maggots. From this material the adult fly was reared. The following spring Dr. Fletcher found the young carrot plants in a garden at Ottawa badly attacked by this insect. In 1897, the insect was reported from Quebec and New Brunswick. In 1901, considerable injury was caused in New York State; at Broadalbin, 6,000 plants were ruined during the season, and traces of the tunnels made by the maggots were found throughout a field of 60,000 plants.

According to Crosby and Leonard,* this insect now occurs in the northern states from Maine to Michigan. It subsists in wild

* Manual of Vegetable-Garden Insects, page 181, 1918.

carrot, and there are said to be two generations each year, though the life history has apparently not been fully worked out in this country.

The eggs are laid in the crevices of the soil around the plant the last of May and hatch in about a week.

The maggot finds its way downward along the root of the plant and begins feeding near the tip of the tap root. Later the larvae tunnel in the fleshy root in all directions. With celery, the fibrous roots are devoured, and the plants take on a pale color and remain stunted. Though some of the maggots of the second brood tunnel in the main root of celery, they seldom enter the leaf stalks.

Parsnips showing the characteristic galleries made by the larvae of this insect were received from Winsted on March 25. Parsnips in my own garden were dug on nearly the same date, and some of the roots were likewise infested. One vegetable grower in Thomaston reports considerable injury from this insect.

At present there is no good method of control. It is hoped that experiments may be conducted towards this end in the near future. Possibly some material for attracting the flies may be discovered, which will aid materially in controlling this pest.

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THE EUROPEAN HEN FLEA IN CONNECTICUT

Ceratophyllus gallinae Schrank

During April the office received a telephone report of a plague of fleas in Madison. As the circumstances seemed rather unusual, Mr. Walden visited the place on April 16. The tenant of the dwelling house had moved in about a month before Mr. Walden's visit. There was a large back yard with a poultry house perhaps 200 feet distant from the dwelling house, which had been vacant since the preceding autumn. On the place was a vegetable garden about 30 x 150 feet, only 25 to 30 feet from the back porch. As the poultry house contained a considerable quantity of hen manure, the tenant had this spread upon the garden and plowed under. The tenant's small child, about two years old, had been out in the yard and was soon covered with blotches on chest and

legs. At first the doctor thought it was hives, but the mother found what appeared to be fleas on the child. An examination showed that the fleas were more abundant on the back porch, on the plowed ground, and especially in the grass around the garden than elsewhere. The poultry house was found to be swarming with fleas. The landlord was notified, sprayed the garden with a mixture of kerosene and burned over the area. Still there were fleas. The garden was then covered with granular quick-lime, and the poultry house was cleaned and limed. At the time of Mr. Walden's visit the fleas were much less abundant than previously, but several were observed and a few collected. Though it was a cold windy day, they were very active and hard to catch. Sweeping with an insect net proved unsuccessful.

The tenants kept on the back porch a garden atomizer filled with a liquid fly killer, with which they sprayed the feet and ankles of any one entering the house from the garden. This liquid was said to kill the fleas.

Apparently the lime was rather effective in killing the fleas. Mr. Walden made a second visit about ten days later and found that the fleas had practically disappeared. Specimens of the fleas were sent to Mr. M. A. Stewart, then at the University of Rochester, who had just finished an investigation for the Crop Protection Institute, in the course of which he announced the presence and rather wide distribution of the European hen flea in this country. Mr Stewart replied, under date of May 13, that the specimens were females of the European hen flea, *Ceratophyllus gallinae* Schrank. This flea is shown on Plate XXIX, b.

This is the first record of the occurrence of this insect in Connecticut. Mr. Stewart has discovered the presence of the pest in different parts of the United States, and has evidence that it is now distributed from Maine to Oregon.* This flea apparently breeds abundantly in nests and on the floors of poultry houses and causes great damage by reducing egg production and the weight of the fowls; thus rendering them unmarketable.

Mr. Stewart has found a satisfactory remedy in Phinotas Disinfectant, a commercial product manufactured by the Phinotas Chemical Company of New York City. This treatment is as follows: Clean the houses of all litter and droppings. Burn the litter and bury the droppings. Dilute the liquid disinfectant with ten times its bulk of water and spray around the floor, walls, ceiling, and roosts, along the principal runways and around the burying pit. Also dip the fowls in the mixture. The dipping should be done in the morning of a sunny day to permit the fowls to become dry as soon as possible.

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* Jour. Econ. Ent., Vol. XX, page 132, 1927.

REPORT OF ACTIVITIES TO CONTROL THE JAPANESE BEETLE IN 1927

W. E. Britton and J. P. Johnson

The work carried on during 1927 was largely of a quarantine nature, such as enforcing the State and Federal Regulations, and scouting for the spread of the Japanese beetle. At this time the towns of Greenwich and Stamford were in the quarantined area. From January 1 until June 15 the quarantine was enforced by Federal men having their office at Mount Vernon, N. Y., and later in New York City. On June 15 the State took over this work and established an office at 682 Main Street, Stamford, Conn. Funds had been appropriated by the State, and these in conjunction with those of the Federal department were used in carrying on the work.

After the summer scouting season was over, the Federal quarantine was extended to include Darien, Easton, New Canaan, Wilton, Norwalk, Westport, Weston, Fairfield, Bridgeport, Shelton, Stratford and Trumbull, becoming effective November 1, 1927. The State quarantine was extended to include the same towns, effective December 1, 1927. The office was moved from Stamford on December 31 to the Hurley Building, Shelton, Conn.

All important roads, totaling 33 in number, were posted with quarantine warning signs to notify the public of the extent of the area and to familiarize them with the regulations.

Scouting

There were two distinct centers from which scouting activities were conducted in Connecticut during the past season. These were Stamford and New Haven.

There were three crews of four men each, and one floating scout operating from the Stamford office. For the first ten days these scouts were stationed in Stamford for the purpose of training them in their work, scouting the towns of Greenwich and Stamford and the vicinity thoroughly. However, no beetles were found, and the entire number of Stamford scouts were taken to Tarrytown, N. Y., for a day's scouting, where beetles were found in small numbers. After this experience the crews were assigned to their summer headquarters; one crew to Norwalk, a second to Danbury, and a third to Bridgeport. The floating scout was sent to Hartford. A crew of three men scouted all classified and unclassified nurseries and greenhouses. No beetles were found. The scouting began July 15 and ended September 7.

The scouting activities were controlled by the man in charge of the Connecticut office, who assigned the areas to be scouted each day, and made periodical visits to the scouting crews. The supervisor visited the crews daily, and carried out the assignments and other orders.

Freight yards, boat landings, city markets, and parks were scouted by the floating scout in Hartford, New Britain, and Waterbury.

The entire scouting force in New Haven consisted of three scouting crews of five men each, one floating scout, and one supervisor. They operated from the Asiatic Beetle Headquarters in Westville, New Haven. All scouting performed east of the Housatonic River was done by them. The daily work was assigned by the man in charge of the Japanese and Asiatic Beetle Control and Quarantine work in Connecticut, and the supervisor visited the crews daily. The crew foremen were experienced men, and after the entire group had scouted in the Asiatic Beetle quarantine area for a few days they were assigned to certain areas in and about New Haven. These men were scouting for the Japanese beetle and Asiatic beetle at the same time.

The floating scout carried on scouting operations in the quarantine area and investigated complaints.

All scouting was performed in the cities, towns, and outskirts. There was not any country-roadside scouting done, as the area was too large to cover, and past experience had proven that there was more likelihood of beetles being found in cities and towns.

Each crew foreman was given instructions to make himself known to the chief of police in each municipality and explain the work in order to avoid confusion and trouble.

Very little trouble occurred during the past season. A few people complained to police headquarters of strangers prowling about, but when the work was explained, the people as a whole coöperated willingly.

The area scouted during the past season included Greenwich, Stamford, Darien, Norwalk, New Canaan, Wilton, Weston, Easton, Westport, Fairfield, Bridgeport, Danbury, Ridgefield, Bethel, Redding, Newtown, Shelton, Stratford, Milford, West Haven, Orange, New Haven, East Haven, Branford, North Branford, Wallingford, Hartford, Hamden, Ansonia, Derby, Waterbury, and Guilford.

LOCALITIES WHERE JAPANESE BEETLES WERE FOUND IN 1927 OUTSIDE THE QUARANTINED AREA

Town	Locality	Date	No. Beetles
Bridgeport	West Avenue	August 2, 4	2
	Park Place	2	1
	State Street	3	2
	Washington Avenue	4	186
	Park Avenue	5	1
	Poplar Street	6	2
	Edwin Street	9	16
	Oak Street	13	1
			211
Darien	Railroad Avenue	July 20	1
New Canaan	Park Street	August 12	1
Number of towns where beetles were found, outside the quarantined area			3
Number of beetles found			213

QUARANTINE ENFORCEMENT

During the period of 1927, in which the quarantine regulations were enforced regarding farm products (June 15 to October 1), only the towns of Greenwich and Stamford were in the area under quarantine. This area was not generally infested, the only infestation being on Broad Street, Stamford.

Because of this condition the likelihood was very small that farm produce originating in Connecticut would be infested. Such produce was certified without actual inspection, and as only a small amount originating in Connecticut was shipped from the area, it was possible for the clerk to certify it.

However, there was a situation caused by local commission men in Greenwich and Stamford, mainly the latter, buying their produce from the New York markets, where the possibility of infestation was great, and reconsigning it to the outside area. This produce was inspected before it was allowed to enter the commission houses where it would be mixed with native produce. Two inspectors were needed for this work, necessitating hours from 5 A. M. to 2 P. M. This inspection actually caused certain articles to be inspected which remained in the area, but saved considerable time and labor by refusing to permit the mixing of native produce with that from New York.

Three main roads leading out of the quarantine area were patrolled. The Boston Post Road was the main highway; the other two were much less traveled and needed only intermittent patrol. One man was stationed at each of these two lesser roads, patrolling eight hours a day, except Sundays.

The Boston Post Road required the attention of nine inspectors, which were organized into three crews of three men each. Each crew was on duty eight hours a day, except Sundays, when the

crews were cut down to two men each, while the hours were the same. This highway is the busiest thoroughfare in Connecticut. As many as 22,000 motor vehicles pass over this road in a day, traffic being in evidence at all hours, but the truck traffic mainly going through from late afternoon until morning. During the day passenger cars and moving vans were more numerous, and these were inspected for farm produce, nursery and greenhouse stock. The men did not attempt to stop all the vehicles, as a serious traffic congestion would have resulted.

Practically all nursery and greenhouse stock was in Class 1. This permitted certification without actual inspection and saved considerable labor. However, when there was any doubt as to the origin of the stock, it was thoroughly inspected as in a Class 3 territory, and likewise, all material passing through the area from points west inside of the quarantine area.

One foreman was employed to aid the men when a new or difficult situation arose.

The following table shows the number of packages of fruit, vegetables and cut flowers certified, and the number of beetles removed from each class of produce at the inspection point:

Article	Number of packages	Number of beetles removed
Corn	218	5
Beans	771	
Peas	120	
Lettuce	245	
Vegetables with tops	934	
Miscellaneous vegetables	2089	12
Miscellaneous fruit	2421	
Bunches bananas	246	1
Boxes cut flowers	49	
Total	7,093	18

The number of bales of hay, straw and sphagnum moss certified for shipment from the regulated area of Stamford during the 1927 season, was as follows:

Hay	Straw	Moss	Total
15	5	1	21

The number of certificates issued on shipments of fruit, vegetables, cut flowers, and hay and straw, was as follows:

	Stamford				
Issued for	"A"	"B"	"C"	"F"	"H"	Total
Fruit and Vegetables		1102				1102
Cut flowers	4			47		51
Hay, straw, and moss	8					8
	12	1102		47		1161

The following table shows the number of vehicles bearing contraband articles intercepted at the Quarantine Line each month for the season:

Month	Darien	Noroton Heights	Springdale	Total
June				
15 to 30	318	20	4	342
July				
1 to 30	581	128	29	738
Aug.				
1 to 30	549	103	28	680
Sept.				
1 to 30	352	46	—	398
Oct.				
1 to 15	32	—	—	32
Total.....	1832	297	61	2190

Nursery and Ornamental Stock

There are thirty-six Class 1 greenhouses and nurseries in the area; others have given up their classification and some establishments remain to be classified when they begin business in the spring. These classified establishments have a total of 310,500 square feet under glass and 1,187 acres of nursery stock.

During the past year 52,287 plants have been certified for shipments to points outside of the quarantined area and a total of 1,007 certificates have been issued for this purpose.

Altogether 308,400 pounds of sand, soil, peat and manure have been shipped to points outside of the quarantine area and 40 certificates were issued.

Summary

The average number of men employed at each different branch of the quarantine work, each month, during the year 1927, was as follows:

	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Scouting.....		30	30	12	0	0	0
Farm Produce.....	13	15	15	10	2	0	0
Nursery and Greenhouse.....		3	3	1	1	2	2
Administrative.....	2	2	2	2	2	2	2
Total number of men.....	15	50	50	25	5	4	4

The total number of each kind of certificates used on shipments of (A) nursery and ornamental stock, (B) sand, soil, peat, etc., (C) manure, (D) hay and straw, (E) fruit and vegetables, and

cut flowers, in the State of Connecticut from January 1 to December 31, 1927, was as follows:

Kind	Farm Produce	Cut Flowers	Hay and Straw	Nursery and Ornamental stock	Sand Soil	Peat etc.	Manure	Total
"A"		4	8	406	34	1	5	458
"B"	1102							1102
"C"								
"D"				84				84
"F"		47		483				530
"F"	blanks			34				34
"H"								
Totals..	1102	51	8	1007	34	1	5	2208

The total number of articles certified and the number of beetles removed, in the State of Connecticut, Jan. 1 to Dec. 31, 1927, was as follows:

Total number of packages farm produce	7,044	Beetles removed	17
" " " boxes cut flowers.....	49	" "	0
" " " bales hay and straw...	21	" "	0
" " " plants certified.....	52,287	" "	0
" pounds of sand, soil, etc.,.....	280,400	" "	0
" " " manure.....	28,000	" "	0
Total.....	377,801	Total.....	17

During the year of 1927 there were three violations prosecuted; three complaints filed before the proper officials and ten violations on file, totaling sixteen in all.

Revision of State Quarantine

As the scouting by Federal men showed that the Japanese beetle occurs in Bridgeport, Darien, and New Canaan, it was necessary to revise the quarantine maps to include these areas. For the sake of safety it seemed best to include also some adjacent territory. Thus the Federal quarantine, effective November 1, 1927, included the southernmost two rows of towns in Fairfield County, comprising the coastal area two towns deep from the Housatonic River to the New York State line, and shown in Fig. 48.

After due notice a public hearing was held at the Station, November 12, 1927, and later a quarantine order was issued, revising the State quarantine to conform to the Federal quarantine. This revised State quarantine became effective December 1, 1927, and is as follows:

STATE OF CONNECTICUT
AGRICULTURAL EXPERIMENT STATION
New Haven, Conn.

Quarantine Order No. 16
JAPANESE BEETLE QUARANTINE

The fact has been established by the Agricultural Experiment Station that the Japanese beetle, *Popillia japonica* Newman, has recently been found in the towns of Bridgeport, Darien, and New Canaan, and in order to prevent shipments of infested material to outside areas, it seems best to extend the quarantine regulations to the towns of Bridgeport, Darien, Easton, Fairfield, New Canaan, Norwalk, Shelton, Stratford, Trumbull,

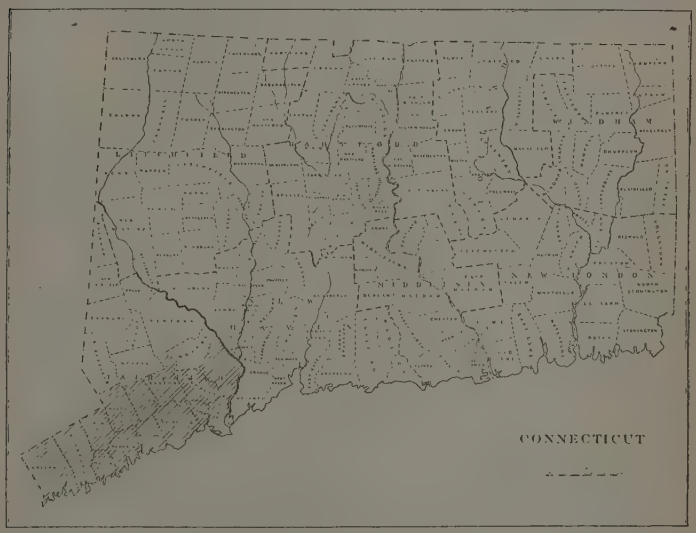

Fig. 48. Map of Connecticut showing area now under State and Federal quarantine on account of the Japanese beetle.

Weston, Westport, and Wilton, in conformity with Federal Quarantine action, effective November 1, 1927.

Now therefore, I, Director of the Connecticut Agricultural Experiment Station, pursuant to the provisions of Chapter 31, Public Acts of 1927, do hereby proclaim the towns of Bridgeport, Darien, Easton, Fairfield, Greenwich, New Canaan, Norwalk, Shelton, Stamford, Stratford, Trumbull, Weston, Westport, and Wilton, all in Fairfield County, to be under State quarantine, and that it shall be unlawful to move from these towns to other points within the State (1) farm, garden, and orchard products of all kinds; (2) grain and forage crops of all kinds; (3) nursery, ornamental, and greenhouse stock, and all other plants; and (4) sand, soil, earth, peat, compost, and manure, except under the conditions prescribed in the rules and regulations announced in Quarantine Order No. 12 (Revision effective

May 1, 1927) and published in Bulletin of Immediate Information No. 58, May 1, 1927.

This order shall take effect December 1, 1927, shall supersede previous orders concerning the Japanese beetle and shall be in force until further notice.

W. L. Slate,
Director, Connecticut Agricultural Experiment Station.

Approved:
John H. Trumbull,
Governor

REPORT OF ASIATIC BEETLE CONTROL AND QUARANTINE WORK IN 1927

W. E. Britton and J. P. Johnson

During the winter of 1926-1927 a few experiments were started to find an insecticide that would act in conjunction with carbon disulphide for controlling the grub stage of the beetle. Others were begun with the view of determining the amount of arsenic and lead taken up by grass from soil which had been treated with arsenate of lead; also the effect of highly acid soils and alkaline soils upon the grub stage.

The headquarters in Westville were closed during the winter months, and the necessary work was directed from the Connecticut Agricultural Experiment Station. Headquarters were reopened about April 11, 1927.

Grub Survey

There were five men employed in making the grub survey during the spring, beginning the work April 25, 1927. The same procedure was followed as was used during the season of 1926. This consisted in digging areas 12 inches by 18 inches, approximately 50 feet apart, in the front and rear yards of the homes; diggings were also made in apparently infested areas. The holes were dug to a depth of 9 to 21 inches, depending upon the soil temperature. The soil was thoroughly examined and, if necessary, sifted to determine the amount of infestation and the position of the grubs relative to the surface of the ground.

During the spring season there was a total of 552 diggings in Westville and 61 diggings in West Haven.

In the fall of 1927, diggings were made to determine the amount of infestation throughout the area to compute the relative values of the soil treatments for grubs which had been made during the preceding spring and the season of 1926; also to determine the increase, if any, of the infestation during the summer of 1927. There was a total of 787 diggings made in Westville, 75 diggings in West Haven, and 69 diggings in New Haven.

During the entire season 17 properties were surveyed for possible grub infestations, as requested by property holders in Westville, East Haven, New Haven, West Haven, and Hamden, outside of the quarantined area.

Soil Treatments

In planning soil treatment work for the spring, four tons of emulsion were purchased from the I. P. Thomas & Son Company, of Philadelphia, Pa. Treatments were begun May 18, and the work was completed June 22. Only two proportioning machines were in operation, due to the fact that only certain areas were to be treated, and a small force of men was employed. Fire hydrants supplied the water in all cases, giving a good pressure and enabling a maximum amount of work to be done quickly. In all, 163,247 gallons of water were used; 141,726 gallons in Westville and New Haven, and 21,521 gallons in West Haven. Rainy weather interfered to some extent, making it impossible to treat the soil for several days at a time.

Altogether 79 properties were treated in Westville, 30 in West Haven, and 2 in New Haven. Very little superficial burning of the grass occurred during the treatments, and this did not warrant any complaints, as the turf recovered in a few days.

Scouting

Scouting was conducted on a much larger scale for adult beetles in the summer of 1927 than during the preceding season. A total of three crews of five men each, one floating scout, and a foreman in general charge scouted around all premises, parks and certain fields in the area consisting of the shore towns from the Housatonic River to Indian Neck, Branford, including New Haven, and West Haven, and the inland towns of Ansonia, Derby, Shelton, Waterbury, North Haven, and Wallingford.

The procedure followed in scouting was to assign certain crews to certain localities, making them responsible for covering the areas thoroughly. The system followed by all the crews consisted in assigning two men to one street, operating on opposite sides and working down two streets, while the foreman of the crew scouted cross-streets and checked the men's work. The general scout foreman assigned the work to crew foremen and visited them every day.

Scouting began July 1 and ended September 9. The scouts were also looking for Japanese beetles in conjunction with the Asiatic beetles, as the plant hosts and procedure were approximately the same. The wages of the scouts were paid from the Federal Asiatic Beetle Appropriation.

Beetles were found at the following places outside the quarantined area:

Town	Locality	Date	No. Beetles
New Haven	272 Canner St.	July 15, 18	2
	116 Carmel St.	" 19	1
	116 Ellsworth Ave.	" 19	1
	316 Winthrop Ave.	" 20	1
	65 Carmel St.	" 21	2
			7
West Haven:	142 Main St.	" 22	1
	449 Second Ave.	" 23	1
	8 Washington Ave.	" 28	1
			3

The quarantine area was thoroughly scouted, and adults were found to be numerous on certain properties and scarce on others. The conditions under which the men worked were a repetition of those of the preceding year. The beetles were shy in attacking the flowers and foliage of plants and difficult to find. From all the reports received from the scouts there was not any evidence of commercial damage done to plants or lawns by the adults.

Quarantine Certification

The quarantine work was carried on by two men who made inspections and certified plants and soil products when calls demanded them. The following plants and soil products were certified:

Materials	No. Packages
Plant packages	2,827
Cut flowers, bunched	17
Plants (flower and vegetable)	4,066
Trees and shrubs	121
Cubic yards of sand and gravel	4,460
Total	11,491

Altogether, 2,891 certificates were issued in certifying material to be shipped out of the quarantined area.

Summary

	Westville	New Haven	West Haven	Totals
Diggings	1,339	69	136	1,544
Treatments	79	2	30	111
Gallons carbon disulphide	645	—	108	753
Gallons water	141,726	—	21,521	163,247
Number of beetles	2,032	17	3	2,052
Acreage treated	10.809+	—	1.36+	12.169+

There were 15 scouts, one general scout foreman, and one floating scout employed during the scouting season.

Altogether, 20 towns were scouted during the summer season. In all, 17 special surveys were made during the year 1927.

A total of 11,491 articles, consisting of plants and soil products, was certified for shipment outside of the quarantine area, using 2,891 certificates.

The results of the last two years' work are somewhat confusing, and it is a difficult matter to give definite figures. However, the condition of the turf in Westville indicates a grub infestation and injury similar to that of the spring of 1926; that is, the existing conditions are no worse at the present time than two years ago. The grub infestations are, however, more widespread and general.

An infestation found at 437 Savin Avenue, West Haven, on May 17, 1926 was treated in the spring and fall of the same year. In the past year diggings were made and summer scouting done. Nothing was found, thus indicating an excellent control or extermination of the beetle at that place.

On October 4, 1926, an infestation of some extent was found on Washington Manor Avenue. This infestation was treated in the fall of 1926 and the spring of 1927. Summer scouting was performed and diggings were made in the fall, yielding three adults and three larvae. When the infestation was found it covered about 25 properties, and the extremely small number of grubs found after treatments certainly indicated a very good control.

MOSQUITO CONTROL WORK IN CONNECTICUT

Season of 1927

R. C. Botsford

In practical control work the 30 or more species of mosquitoes found in Connecticut are placed in two groups: those breeding in fresh water, and those breeding in salt or brackish water. The general methods employed for the control of these two groups are the same, but the chief practical difference is in their habits of flying and biting. The fresh water breeding mosquitoes fly short distances and bite only in the early morning or evening, whereas the salt water breeding mosquitoes bite at any time during the twenty-four hours of the day, breed in greater numbers, and fly long distances. The salt water breeding mosquitoes are, therefore, the greater nuisance, especially at our shore resorts, where they affect a large percentage of the State's population.

It is the policy of this Station, therefore, to direct its attention to ditching the salt marshes and maintaining the work according to statute.

Surveys and estimates of the cost of treating both salt marsh and fresh water swamp areas are made from time to time throughout the year upon request, without charge.

Present State funds are inadequate to perform the work prescribed by the General Statutes and demanded by our citizens. The State appropriation is only $7,500 a year. From this amount

must be paid the salary and traveling expenses of the deputy in charge, labor to patrol and clean ditches on more than 5,000 acres of salt marsh, and major repairs on dikes, tide gates, and culverts. In spite of every possible economy in the expenditure of the funds, much important repair work must be abandoned.

A deficiency appropriation of $3,000 was granted this year but was restricted in its use to major repairs. It was received too late to be expended before the legal time limit on the use of such funds had expired, and a part was returned to the State treasury.

Due to the unusually wet season, a maximum amount of both fresh water and salt water mosquito breeding occurred in untreated areas. However, in Westport, Clinton, and Westbrook, where ditching of the salt marshes has been under way, a striking reduction of mosquitoes was reported. Ditched areas which required overhauling bred mosquitoes heavily throughout July and August.

Funds for regular maintenance work were exhausted about January first, and no patrol work was started until July first, when the new appropriation became available. During April, May, and June, a few men were retained by funds furnished for special work by the State Park and Forest Commission, the towns of Stamford and Fairfield, and Mr. W. A. Bryan of Branford.

The following table gives the status of the salt marsh areas of Connecticut:

STATUS OF CONNECTICUT SALT MARSH AREAS, 1927

Town	Salt Marsh Areas	Salt Marsh Ditched	Maintained by State	Total Cost of Ditching	Labor, Cost Maintenance, 1927	Labor, Cost to Complete Ditching
Greenwich	200	200	None	.....	.....	.....
Stamford	300	300	200	$3,245.80	$458.53*	.....
Darien	300	300	None	3,800.00	.....	.....
Norwalk	600	600	None	7,500.00	.....	.....
Westport	400	400	None	5,913.82	.....	.....
Fairfield	1,200	1,200	1,200	8,400.00	3,390.87**	.....
Bridgeport	173	....	....	.....	.....	$3,000.00
Stratford	1,315	....	....	.....	.....	20,000.00
Milford	630	....	....	.....	.....	9,500.00
West Haven	463	222	222	Ditched with New Haven	208.25†	3,500.00
New Haven	750	750	675	12,000.00	.....	750.00
Hamden, No. Haven, East Haven	2,042	....	....	.....	.....	30,000.00
East Haven	482	150	50	Ditched with New Haven	6.40	6,500.00
Branford	895	578	578	.....	2,360.70‡	4,800.00
Guilford	1,085	1,085	1,085	20,000.00	1,940.34	.....
Madison	1,005	1,005	1,005	.....	3,405.57‡‡	.....
Clinton	785	677	None	10,000.00	.....	2,000.00
Westbrook	500	375	None	6,575.93	.....	1,000.00

* City of Stamford, $339.
** Town of Fairfield, $2,955.45.
† Town of West Haven, $125.
‡ Indian Neck Association, $200.
‡‡ State Park and Forest Commission, $2,800.

STATUS OF CONNECTICUT SALT MARSH AREAS, 1927—*Cont.*

Town	Salt Marsh Areas	Salt Marsh Ditched	Maintained by State	Total Cost of Ditching	Labor, Cost Maintenance, 1927	Labor, Cost to Complete Ditching
Old Saybrook	1,373	100	None	.....	.....	20,000.00
Lyme	493	....	....	.....	.....	7,500.00
Old Lyme	1,393	....	....	.....	.....	21,000.00
East Lyme	424	....	....	.....	.....	6,500.00
Waterford	204	....	....	.....	.....	3,500.00
New London	34	....	....	.....	.....	500.00
Groton	304	50	50	1,000.00	15.00	4,000.00
Stonington	555	....	....	.....	.....	8,500.00
	18,005	7,992	5,065	$78,435.55	$11,785.66	$152,550.00

It was the practice of this Station formerly to assign some local man in each town for patrol and maintenance of the salt marshes of the town. These areas are usually small and widely separated, and in the maintenance work considerable time is lost in traveling from one point to another. Those men do not own autos, and in many cases trolleys are not available, and often a man is forced to walk several miles from his home to the job and back, sometimes consuming as much as one and a half to two hours twice a day in this manner. There is also a certain element of danger to a man in allowing him to work alone on some marshes.

After a trial of two seasons, it was found more satisfactory and efficient to hire a working foreman with an auto and pay him mileage for the use of his auto to transport the men and tools from place to place, assigning to him a group of towns or salt marsh areas.

To maintain properly the state-accepted areas, three such units will be necessary after this biennium.

Below is a preliminary schedule of the minimum budget for mosquito control work for the next biennium, July 1, 1929 to July 1, 1931:

		UNIT NO. 1	
Stamford	300 acres	Working foreman	$1365.
Westport*	400 "	1 laborer 36 weeks at $24	864.
Fairfield	1,200 "		
	1,900 "		
		UNIT NO. 2	
West Haven	463 "	Working foreman	$1365.
New Haven	750 "	3 laborers 36 weeks at $24	2592.
East Haven	482 "		
Branford	895 "		
Groton	50 "		
	2,640 "		

*To be added July 1, 1929

UNIT NO. 3

Guilford	1,085 acres	Working foreman	$1365.
Madison	1,005 "	2 laborers 36 weeks at $24	1728.
Clinton*	785 "		
Westbrook*	500 "	Total for three units	$9279.
	2375 "		

*To be added July 1, 1929

SUMMARY

Labor	$9,279.
Supervision, etc.	3,000.
Contingent	221.
Annual	$12,500.
Biennial period	$25,000.

THE WORK BY TOWNS

NEW HAVEN

New Haven, East Haven, Branford, and Guilford were patrolled as one unit as in 1926. Very little ditch recutting was required in New Haven this year, as the salt marsh areas were found in very good condition. A new main ditch was dug at Fort Hale to facilitate drainage north of Fort Hale Road.

The New Haven Chamber of Commerce committees have been active throughout the season on a well-developed program to eliminate mosquito breeding in the salt marshes of towns surrounding New Haven.

This Station made a preliminary survey of this situation, which was published in the Report of this Station for 1926.

Substantial sums for treating these salt marsh breeding areas have been appropriated by New Haven, East Haven, and Branford. The towns of Hamden and North Haven have not as yet appropriated funds for this, although individuals in the five towns have contributed generously.

WEST HAVEN

Dr. Charles D. Phelps assumed entire charge of anti-mosquito work this season. The State-accepted salt marsh areas were kept free from breeding under his supervision, but mosquitoes emerged in great numbers from untreated fresh water areas.

EAST HAVEN

The salt marsh areas under State care were patrolled and ditches cleaned where necessary to facilitate drainage. No mosquito breeding was found on these areas.

Salt marsh mosquitoes which developed in untreated areas and were so plentiful early in the summer disappeared in July and August, and fresh water swamp mosquitoes took their place in even greater numbers.

BRANFORD

Salt marshes east of the Branford River were well patrolled and ditches repaired where necessary.

A new concrete tide gate sill was installed at Hubbard's Bridge on the Branford River. Funds for this were made available through a deficiency appropriation by the General Assembly. New gates will be installed when the necessary funds are received.

GUILFORD

The recutting of ditches in Guilford has progressed as rapidly as funds would allow. The salt marsh areas between West River and East River south of the railroad were completed this fall, but must be patrolled thoroughly in order to eliminate the smaller breeding places which may yet exist.

A serious leak under the tide gate sill at Great Harbor was repaired this season at considerable expense. The property owners east of the tide gate failed in their promise to repair the weak dike there. As a result a storm broke through and destroyed a large section of the dike and flooded the marsh.

The marsh at Shell Beach was improved by reditching and lowering a culvert.

MADISON

The State Park and Forest Commission reditched practically all of the salt marsh areas at Hammonasset Park under the supervision of this Station. This work will eliminate the most prolific breeding places in the town.

The remaining salt marsh areas were patrolled as usual and the culverts and outlets at the beaches kept open. Some culverts were damaged this winter by storms.

CLINTON

The Clinton problem remains unchanged. One hundred acres of salt marsh are unditched, and the areas ditched cannot be approved by the State on account of faulty ditching. Some funds are available to correct the faulty ditches, and this may be done next season. A new outlet through Grove Beach may be necessary to lower the water level in the rear of Grove Beach and so make it possible to properly maintain the work.

WESTBROOK

Funds appropriated for ditching salt marshes of this town were exhausted before the work was completed. This was due to the fact that the inland salt marsh areas which were left to the last were in extremely soft condition and required double ditching. The work will be completed next spring on funds already appropriated by the town.

GROTON

This small area was patrolled as usual. Spur ditches were placed where necessary and main outlets were deepened.

FAIRFIELD

The town of Fairfield has always been set up as an example of a good mosquito control work and co-operation in furnishing funds for the work. The salt marsh areas were patrolled as usual, the town furnishing the labor. The draining of fresh water swamps and stagnant pools progressed steadily with town and voluntary labor. Supervision of both salt water and fresh water work was furnished by the State.

WESTPORT

Ditching of the salt marshes of the town of Westport was completed early in the season. The total footage of 10 x 24 ditches cut with special tools was 163,529 feet. A great deal of day labor was required to complete the ditching where rocks and ledges interfered. The extra expense of this work ran the cost of the work somewhat over our original estimate.

The work was approved on October 1, 1927 and will be maintained under State supervision when funds are provided.

STAMFORD

The Stamford areas were patrolled and kept in repair. The city of Stamford paid some of the labor cost. New roadways and hydraulic filling interfered somewhat with the work. The city continued its treatment of fresh water swamps.

MISCELLANEOUS INSECT NOTES

Severe Injury to Fruit by the Green Apple Aphid.—It has been mentioned on page 198 of this Report that the green apple aphid, *Aphis pomi* De Geer, was so very abundant in 1927 that it attacked and injured the young fruit in a manner similar to the rosy apple aphid, *Anuraphis roseus* Baker. Young apples injured by the green apple aphid are shown on Plate XXVIII, b.

Brown Scale on Arborvitae.—While inspecting nurseries in Hartford, August 13, 1927, Mr. Zappe collected material of a brown scale which was rather prominent on the twigs of arborvitae. Some of this material was submitted to Mr. Harold Morrison of the U. S. Bureau of Entomology and identified as *Lecanium fletcheri* Ckll. Some entomologists consider this species synonymous with the European fruit lecanium, *Lecanium corni* Bouché, but until further study has settled this point, it is perhaps best to allow the former name to stand. Probably this insect can be kept under control by spraying with nicotine solution and soap.

Abundance of the Mealy Plum Aphid.—The mealy plum aphid, *Hyalopterus arundinis* Fabr., occurs on European plum, *Prunus domestica* Linn., from which it migrates to reed grass, *Arundinaria* sp. This aphid is usually clustered on the under side of plum leaves, often covering the leaves, and the wax secretion gives a peculiar mealy appearance of bluish tint. In 1927 this insect was unusually common. It was received from New Haven on June 17, and was abundant at the Station Farm at Mount Carmel. Plate XXVIII, a, shows some infested leaves where all the aphids had been killed by spraying with a pyrethrum-soap emulsion.

Watch for 17-year Locust in 1928.—In 1911, Brood No. 11, of the 17-year locust or periodical cicada, *Tibicina septendecim* Linn., appeared in Connecticut, especially on the trap rock ridges of New Haven and Middlesex Counties and the southern portion of Hartford County. When abundant the females cause considerable injury to fruit trees by splintering the twigs in laying their eggs. This brood No. 11 is due to appear again in Connecticut in 1928. The insects may be expected to commence emerging about the middle of May and continue for about a month. In 1911, they were the most abundant about the middle of June. The Entomologist will welcome any information regarding the occurrence of this curious insect the coming season.

Abundance of the Raspberry Sawfly.—The raspberry sawfly, *Monophadnoides rubi* Harris, was present in considerable numbers in raspberry plantations. Specimens were received from West Haven, June 16, and Dr. Friend visited a garden in Hamden on June 15 where the raspberry plants had been stripped of their leaves by the small spiny larvae. An illustration of one of these larvae is shown on Plate XXIX, a, and more complete information may be found in the Report of this Station for 1918, page 329. Early spraying, or dusting the foliage with lead arsenate or fresh hellebore will be found effective in protecting the plants from defoliation. Lead arsenate should not be applied late in the season when the fruit is nearly ready to harvest.

The Poplar and Willow Curculio.—On June 7, some bark of the pussy willow was brought to the Station, containing several grubs of the poplar and willow curculio, *Cryptorhynchus lapathi* Linn. The owner had in his yard a small willow tree which had been attacked and nearly killed by the grubs. Many willows of this variety growing wild are killed in the same manner, and apparently there is no practical method of saving them. A section of the bark and some of the grubs are shown on Plate XXIX, c. These grubs were almost grown, and there is only one generation each year. The adult is a snout beetle which emerges in late July or August. The eggs are soon laid and hatch, and the larvae pass the winter in the galleries under the bark.

The Blackberry Psyllid.—The blackberry psyllid, *Trioza tripunctata* Fitch, feeds upon the native blackberry and sometimes attacks the cultivated varieties. The adults hibernate and appear on the blackberry plants soon after growth starts in spring. Eggs are laid in the soft pubescence of the unfolding leaves and young canes. The nymphs are gregarious, feed on the under side of the leaf, and are covered by curved wax filaments, as shown on Plate XXXI, a. Both nymphs and adults suck the sap from the plant and cause it to grow in a distorted manner; also shown on Plate XXXI, b. Though little study has been given this insect, and control measures have not been worked out, it is probable that spraying with nicotine solution and soap will prove effective.

A New Mosquito Ditching Spade.—In the history of cutting ditches for mosquito elimination several spades have been devised and used. So far each has developed some disadvantage when put to the practical test of cutting several hundred feet of ditches in the salt marsh. The spade, shown on Plate XXXII, has recently been devised by Mr. R. C. Botsford of this Station. It is lighter than some of the others, has two wood handles joined at the top by a crosspiece, and is convenient to use. It has a blade 36 inches long, with handles 52 inches long and a total length of 78 inches. The blade as shown extends 25 inches below the fulcrum, but the fulcrum may be raised to cut a deeper ditch. This spade cuts a ditch 10 inches wide and has a long slot in the center of the blade for suction relief. Wings project forward for cutting the sides of the ditches. This spade has been patented by Mr. Botsford.

The Greenhouse or Celery Leaf-Tyer.—The greenhouse leaf-tyer, *Phlyctaenia ferrugalis* Hubn., also called the celery leaf-tyer, was present in the Station greenhouses and caused considerable injury to alfalfa and other plants being grown under experiment. The larvae feed on the under side of the leaves, and the food plants include nearly all of the common vegetables, many weeds, and a large number of ornamental herbaceous plants growing both under glass and out of doors. There are said to be four generations each year in the open but under glass there may be seven. When disturbed, the caterpillars wriggle back and forth. They are from half to three-fourths of an inch long, translucent greenish yellow, with a narrow dark green median stripe. A larva feeding upon a geranium leaf is shown on Plate XXVII, a. Spraying with lead arsenate is the remedy. Small potted plants may be dipped into the poison liquid. It is necessary to coat the under side of the leaves with poison because the caterpillars generally feed there. Such plants as celery and lettuce must be protected in some other manner.

Cottony Maple-Leaf Scale on Dogwood.—During the summer of 1926, cottony scales were rather abundant on the under side of the leaves of two trees of flowering dogwood, *Cornus*

florida, growing on the premises of the Entomologist in New Haven. Specimens were collected on October 8, 1926, and on June 27, 1927, and submitted to Mr. Harold Morrison of the Bureau of Entomology at Washington. It was impossible to identify the species from the material collected in October, but from the lot collected in June Mr. Morrison expressed his opinion that the insect is *Pulvinaria acericola* Walsh & Riley, though in case of a critical revision of the genus, it may be necessary to give it another name. The mature females and their ovisacs are shown on Plate XXX, a. This insect passes the winter in a partially mature condition on the twigs. In May the females migrate to the leaves and deposit their eggs in the large white masses of wax of the ovisac. The young hatch in June and feed upon the leaves, but early migrate to the twigs for the winter. The cottony maple scale, *Pulvinaria vitis* Linn., matures and deposits its eggs upon the twigs and branches.

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a. View at Woodbridge infestation where 416 egg-masses were found and destroyed.

b. Seymour infestation where 121 egg-masses were found and destroyed.

GIPSY MOTH WORK

a. Trees stripped by gipsy moth caterpillars near Fall River, Mass. Photo July 12, 1927.

b. View of woodland near Fall River, Mass., partially defoliated by caterpillars. Photo July 18, 1927.

GIPSY MOTH WORK

a. Japanese beetle quarantine sign on Post Road, Darien.

b. Inspection booth, Japanese beetle quarantine, Darien.

JAPANESE BEETLE QUARANTINE

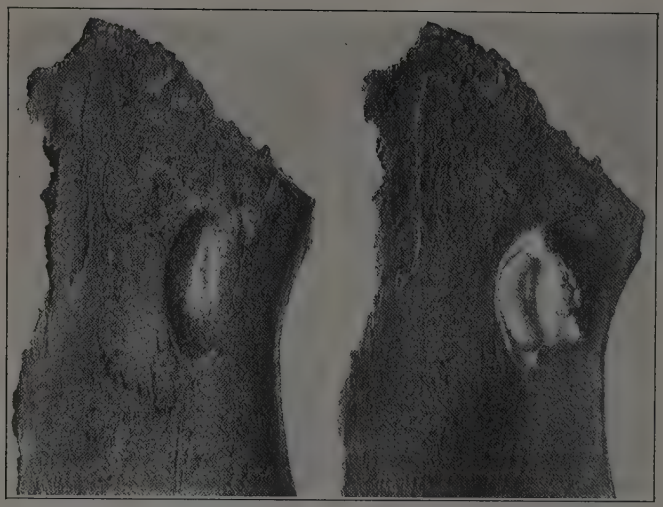
a. Truck stopped by inspectors, Post Road, Darien.

b. Covered truck opened for inspection, Post Road, Darien.

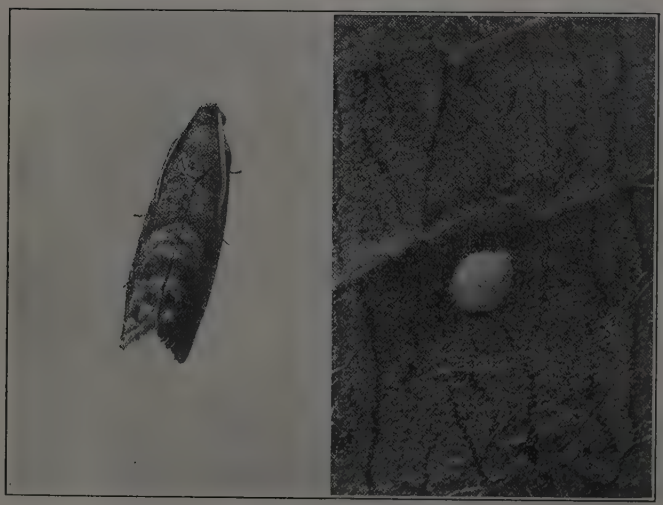
a. Trees partially defoliated by cankerworms, East Lyme.

b. Cankerworms crawling on side of cottage, East Lyme.

CANKERWORMS

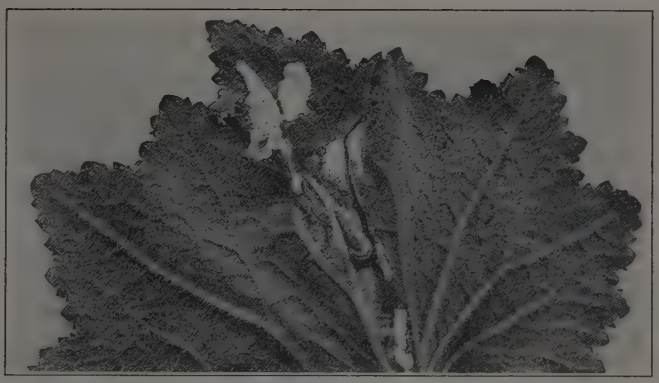


a. Left, cocoon under bark; right, cocoon opened to show insect. Twice enlarged.



b. Left, adult moth, enlarged six times; right, egg, enlarged eighteen times.

ORIENTAL PEACH MOTH



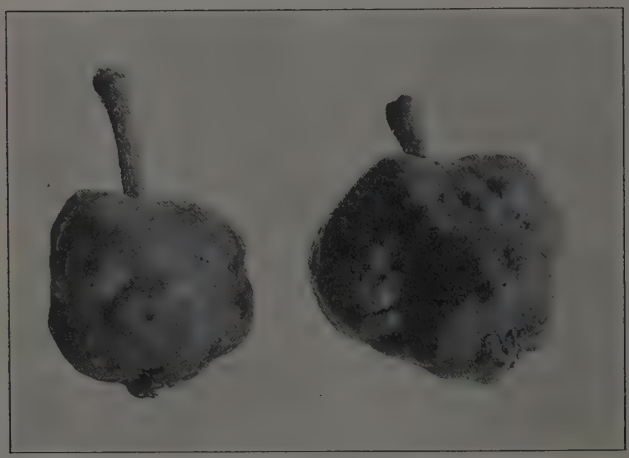
a. Larva of greenhouse leaf-tyer feeding on geranium. Natural size.

b. Adult of the greenhouse leaf-tyer
Twice natural size.

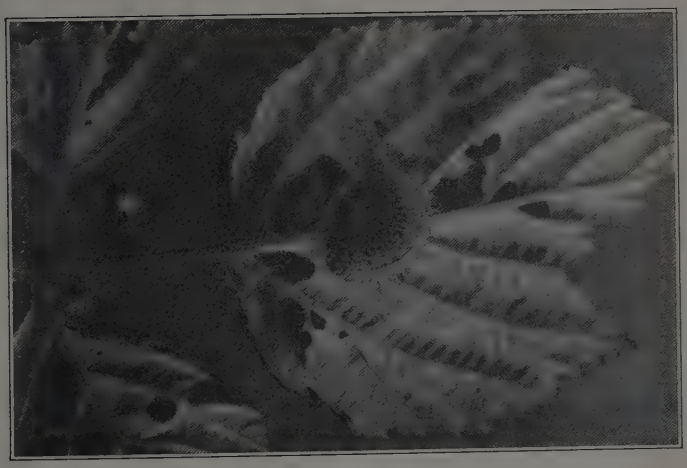
c. View in peach orchard showing bait pail to catch Oriental peach moths.

GREENHOUSE LEAF-TYER AND ORIENTAL PEACH MOTH

a. Mealy plum aphid on European plum; killed by spray of Pyrethrum soap. Natural size.

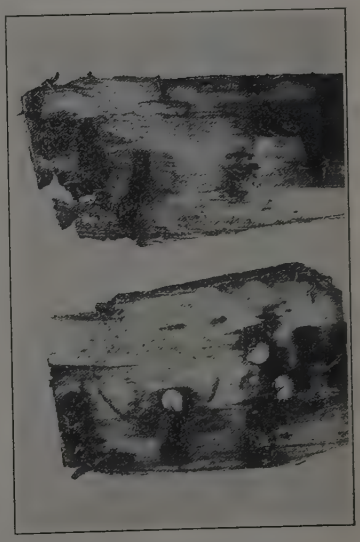


b. Apples injured by green apple aphid.



a. Raspberry sawfly: larva and injury to leaf. Twice natural size.

b. European hen flea. Enlarged about 25 times.



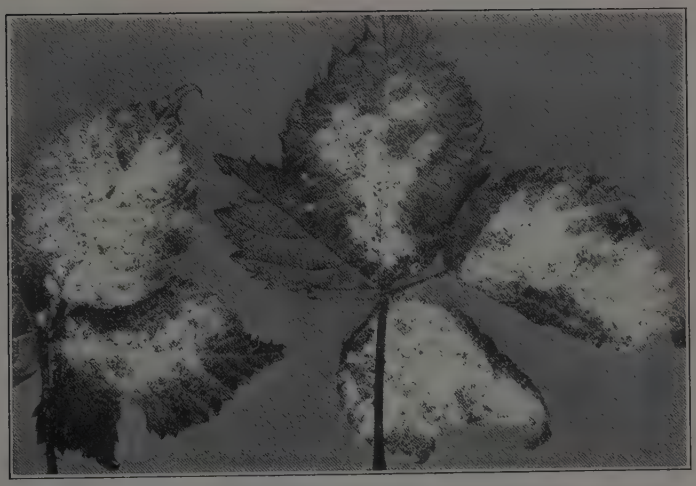
c. Grubs of poplar and willow curculio. Natural size.

RASPBERRY SAWFLY; EUROPEAN HEN FLEA; POPLAR AND WILLOW CURCULIO

a. Cottony maple-leaf scale on leaves of flowering dogwood. Natural size.

b. Tunnels of carrot rust fly in parsnip. Slightly reduced.

COTTONY MAPLE-LEAF SCALE AND CARROT RUST FLY

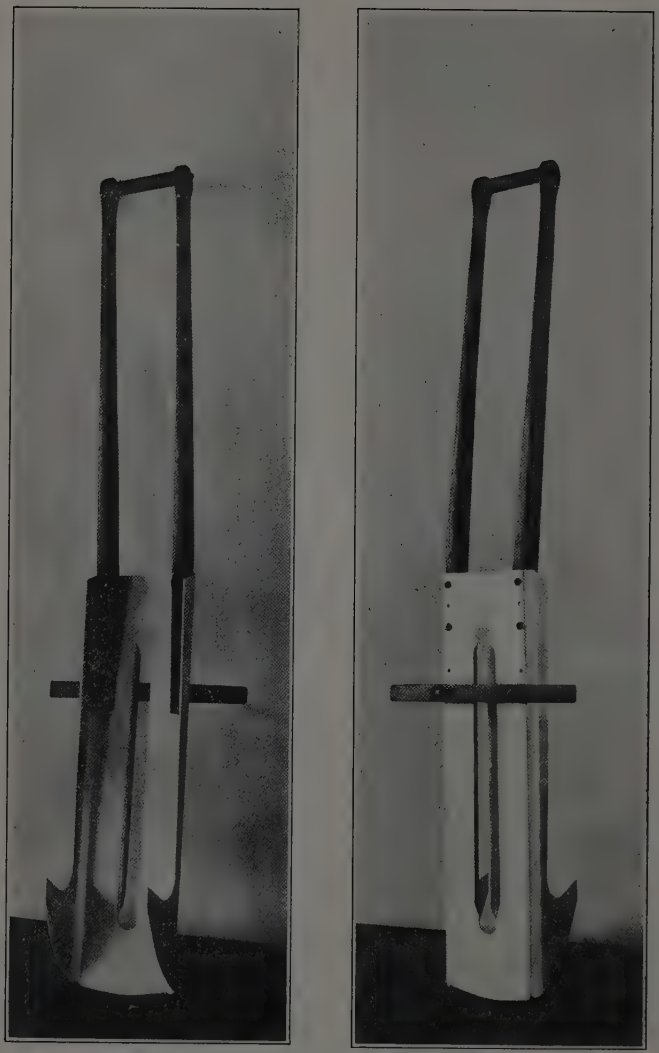


a. Nymphs on under side of leaves. Slightly reduced.

b. Gall or distorted leaves and stem, caused by nymphs and adults. Slightly enlarged.

BLACKBERRY PSYLLID

PLATE XXXII.



The Botsford Patent Ditching Spade, front and rear views.

a. View of a small pool between ditches which dried up completely after the ditches were cut. Clinton.

b. View in Clinton, showing former mosquito breeding area which, since ditching, is wholly dry.

a. Health officer, Stamford, explaining to children how mosquitoes breed in receptacles around the dump.

b. Salt marsh breeding pools, Quinnipiac Marsh, Hamden.

a. Cleaning old ditch.

b. Cutting new ditch without special tools.

a. The Botsford spade lifted ready to be plunged into the turf.

b. Removing the sod.